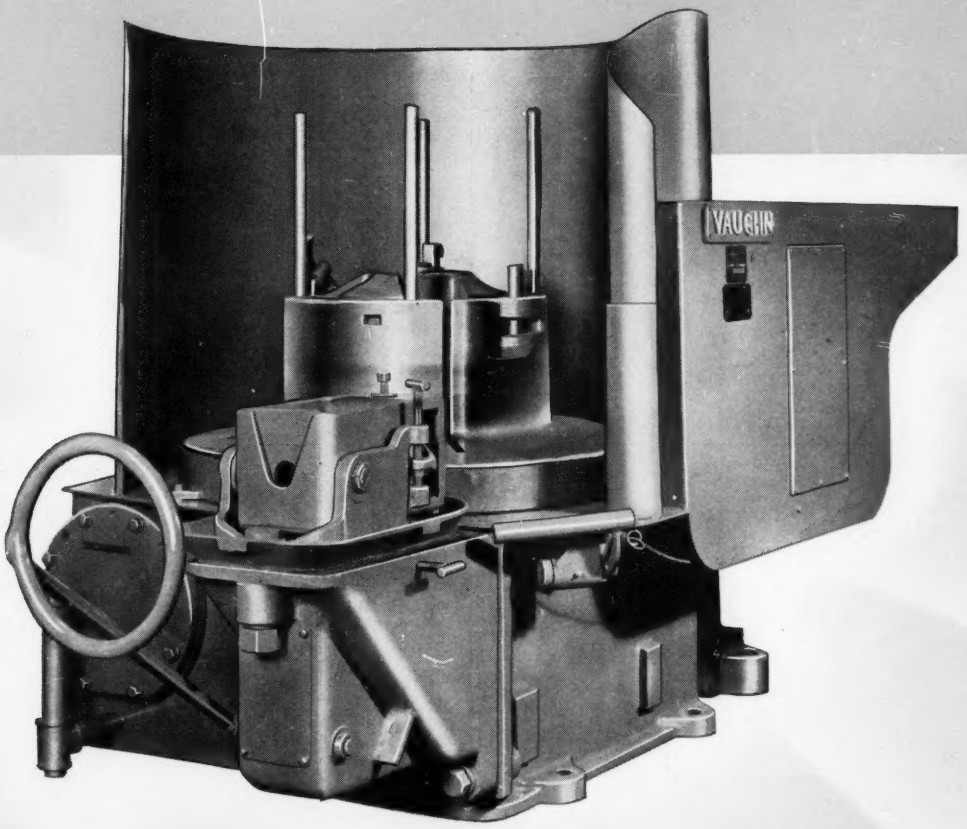
WIRE AND WIRE PRODUCTS

JANUARY 1956



Over 1,000

VAUGHN® MOTOBLOCS®

are in daily operation throughout the wire drawing industry in the United States and sixteen foreign countries.

Built in eight different basic sizes for drawing 1¼" diameter stock and smaller—the MOTOBLOC is available in single or double deck types. Air and/or water cooled, or with push-up type blocks.

The VAUGHN MACHINERY CO.
CUYAHOGA FALLS, OHIO, U. S. A.

COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

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it's new...it's different... it's ideal for handling and processing WIRE!

PAYOFFPAK—Continental's newest fibre container—offers wire manufacturers and fabricators a revolutionary new development in wire packaging, handling and dispensing.

SAVES WORK—Wire is automatically packaged in the Payoffpak as it is drawn, eliminating such operations as stripping, tying, handling, splitting and wrapping.

SAVES TIME—Payoffpak can hold 600 lbs. Downtime on the wire drawing machine, due to stripping operations, is greatly reduced.

ELIMINATES REELS—Single standard-size Payoffpak eliminates reels and need for wide range of block sizes.

CUTS SHIPPING COSTS—Inexpensive, light-weight Payoffpaks travel for less because of extremely light tare weight.

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A survey indicates that often more than 50 labor steps are needed to convert 500 pounds of steel wire in standard eight inch coils—but you can do the same job with Payoffpaks in an average of five operations. No wonder they are calling this new container "the long-playing record of the wire industry" See how Payoffpaks can pay off for you. Call Continental for complete information on this exciting new way to package, handle and dispense wire.

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Pittsburgh yarns have proved their high quality with numerous manufacturers. If you have not yet put them to your tests, you are invited to make arrangements through our executive or district sales offices. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.

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Machines can solve any wire straightening or cutting problems

No. 11-F TRAVEL-CUT
with special extension

This machine was engineered to meet special requirements for custom cutting a wide variety of concrete reinforcing bars up to 50 feet in length

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eliminates waste time and fatigue by placing operator at one position

By the simple movement of a lever the operator can set the electric limit switch to cut any desired length from 6 to 50 feet. A dial graduated in feet and inches tells him the exact length the machine will cut. A preset counting device stops the machine when the proper number of pieces is cut.

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for drawing fine wire
at greater profits

in wire mills throughout the world,
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WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 31 January, 1956 No. 1

Designated as Official Publication By The Wire Association

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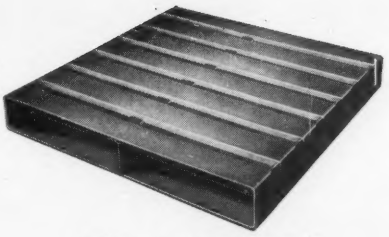
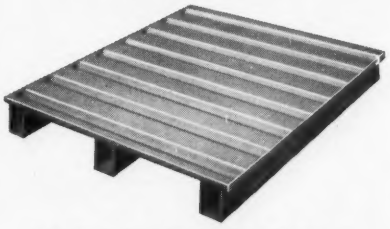
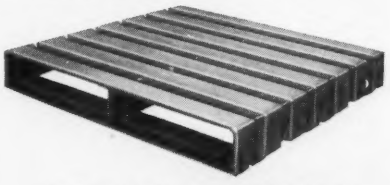


P-14 Double Face Steel Pallet.



P-12 Single Face Steel Pallet with two- or four-way entry.



P-16-S Semidouble Face Steel Pallet for use with trucks with retractable wheels as well as fork-lift trucks.

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wood
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sizes
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types
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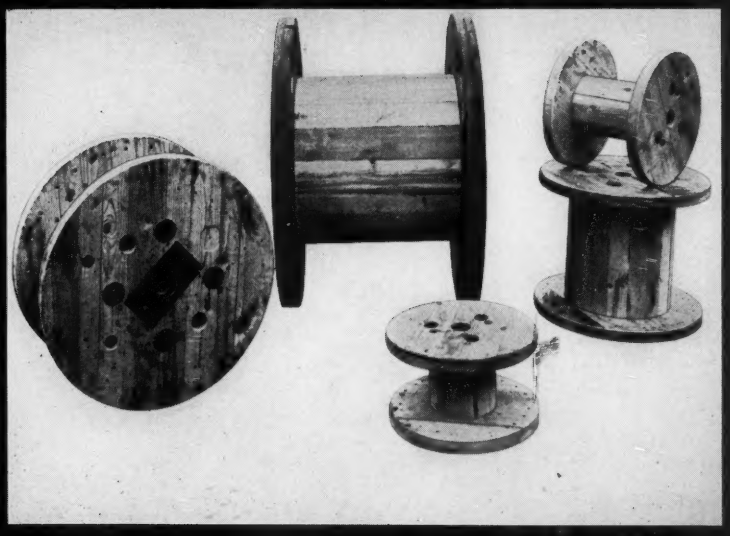

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WOOD REELS"

PROPERTIES OF KENNAMETAL DIE GRADES

Grade	Hardness (Rockwell A)	Transverse Rupture psi	Young's Modulus of Elasticity psi	Compressive Strength psi	Suggested Applications
K82 K84 K86	90.0 91.0 91.5	275,000 300,000 250,000	65,500,000 74,000,000 72,000,000	663,000 600,000 590,000	Draw dies (all sizes) for drawing tubes, bars and wire; for cupping and deep drawing.
K90	85.0	360,000	61,600,000	518,000	Heavy blanking dies up to 3/16" steel. Dies for: cold-heading, nail gripping, nibbling, swaging steel rods, heavy curling, coining.
K91	86.5	380,000	64,400,000	540,000	Light-heavy blanking up to 1/16" steel; rivet sets, crushing hammers, washers, dies.
K92	87.5	385,000	71,900,000	572,000	Lamination dies on .004" to .035" silicon steel; medium blanking dies softer metals up to .040"; heavy forming dies; heavy heading machine hammers; hardware curling dies.
K94	90.0	325,000	77,900,000	600,000	Tube swaging dies; light blanking up to .020" silicon steel; medium blanking, softer metals up to .040"; heavy forging dies; heavy heading machine hammers; curling dies for hardware.
K95	90.5	300,000	82,000,000	644,000	Light blanking up to .015" silicon steel; light heading hammers; wear-resistant parts.
K96	92.0	250,000	94,300,000	800,000	Dies for asphalt floor tile; slate-covered asbestos shingles; abrasive-covered roofing papers; and in the paper industry for slitter knives and plates; blanking and pressing dies; compacting dies for powder metallurgy, wear-resistant parts.

You can select the right grade of Kennametal* for each specific die requirement

With six grades in the "90 series" and three grades in the "80 series," Kennametal offers the right grade for any die application. The 90 series covers the full range of tungsten carbide grade requirements—from K90 with exceptional strength for heavy operations to K96 with maximum resistance to wear for such jobs as compacting and cutting highly abrasive materials.

In the 80 series, Kennametal offers three exclusive grades with unique properties not found in any other carbide. These three $WTiC_2$ grades, with a special slippery quality, have been created especially for drawing, forming and sizing operations where the slightest amount of galling or pickup cannot be tolerated.

From these two groups you can select the right grade for each specific job to assure highest production rates, to reduce die cost and maintenance, and provide products of uniformly accurate dimension and finish. Kennametal die engineers will gladly work with you in analyzing your die operations. They can show you performance reports on Kennametal over a wide range of applications—many of which may be similar to your operations. Call your nearest Kennametal office or write us direct. If you wish more information, send for Booklet B-100 and a copy of our new die grade selection chart. Kennametal Inc., Latrobe, Pa.

*Registered Trademark

Use Kennametal Die Grades for blanking, stamping, compacting, perforating, cold heading, swaging, forming, cupping, drawing. Illustrations show a few of the many types of die parts made of Kennametal for producing a diversification of shapes to exact tolerances with a minimum of finish grinding.

7299

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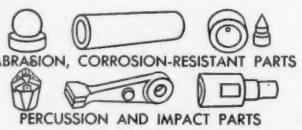
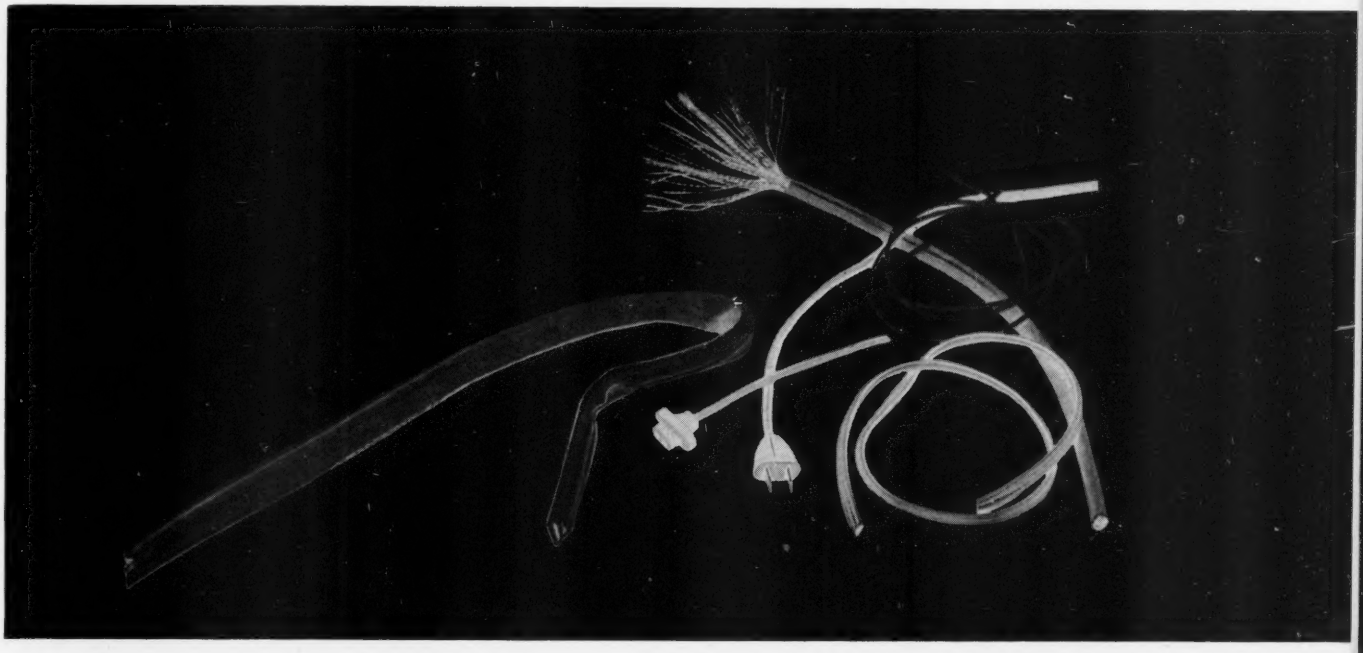
KENNAMETAL
...Partners in Progress



Faster mixing of dry blends!

OPALON* 300-FM *(vinyl chloride resin)*



speeds production of wire and cable

*OPALON: REG. U. S. PAT.

All dry blend mixing can now be faster and more efficient. Opalon 300-FM vinyl chloride resin has a rapid and uniform rate of plasticizer absorption. It quickly dries up extrusion and injection molding blends.

There are other advantages, too: Opalon 300-FM brings you outstanding heat stability, clarity and pigmentation characteristics.

Its excellent physical and electrical properties recommend it to wire and cable extruders. It has been accepted by Underwriters' Laboratories as interchangeable with other approved vinyl chloride resins.

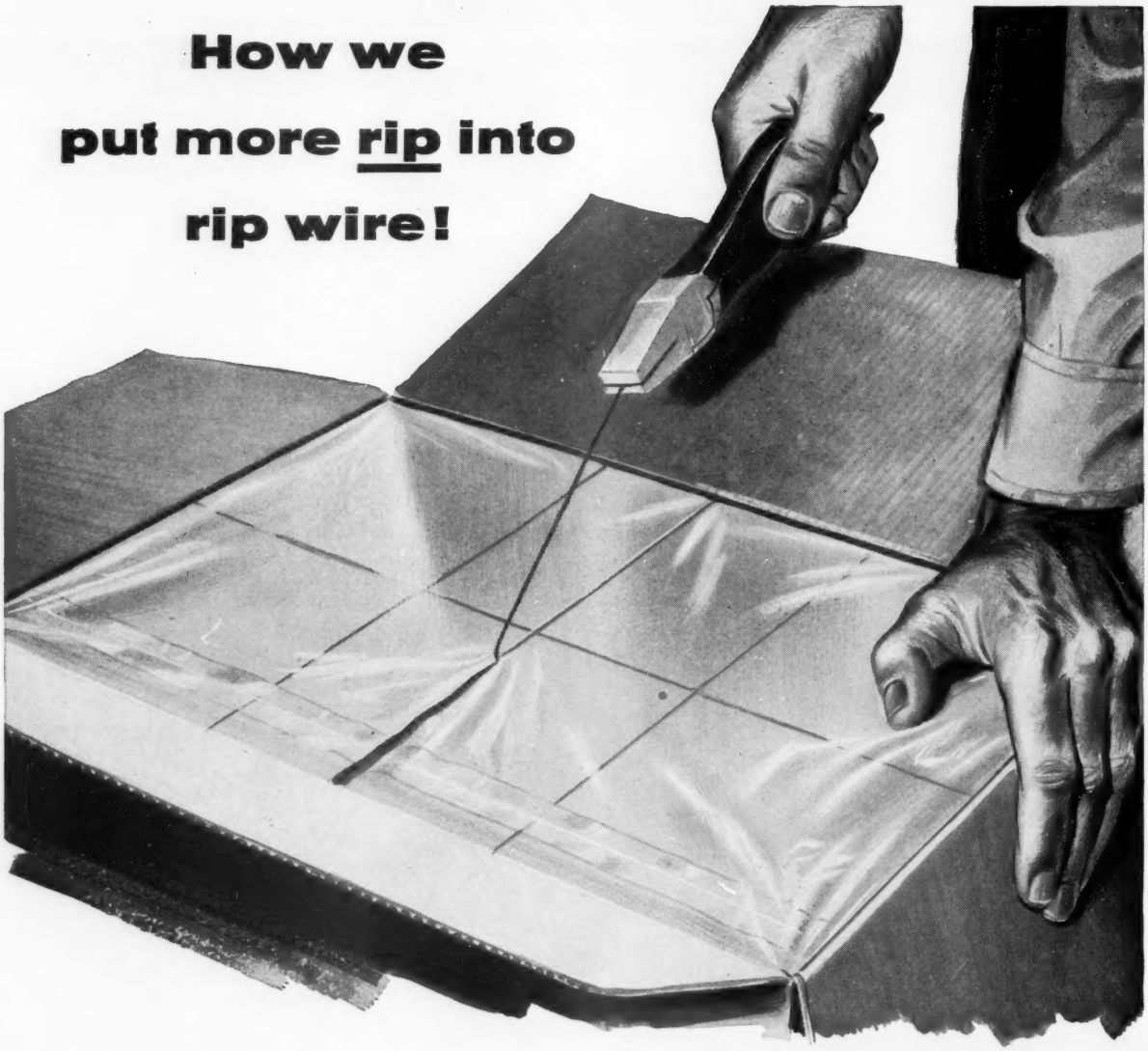
Not only is Opalon 300-FM the ideal resin for dry blend processing. Its remarkable qualities are equally valuable in mill-mixing or intensive-mix processing.

For technical bulletin, write to Monsanto Chemical Company, Plastics Division, Dept. WI-1, Springfield 2, Massachusetts.

MONSANTO

Where creative chemistry works wonders for you

How we put more rip into rip wire!



● Industry often wraps its products in heavy paper to protect it from damage due to moisture, handling and other causes. To make these packages or bundles easier to open, *Worcester Wire Works* has developed a special rip wire for inclusion in the wrapping.

To get even greater protection, some products are wrapped in plastics rather than paper. And this caused a problem. Ordinary rip wire wouldn't cut the tough plastic.

Our *Worcester Wire Works Division* solved the problem by developing a special rip wire with a knurled surface that literally put teeth into the wire. It cuts through the toughest plastic coating as easily as a buzz saw.

Not all of the problems we solve for industry have such simple solutions. Often, we are called upon to develop steel and wire with completely new characteristics . . . to combine seemingly incompatible factors or properties. And quite frequently these are developments that other manufacturers have given up on.

If you have a problem calling for special development work in steel or wire . . . either in creating a product or finding new and better ways to make or use it . . . it will pay you to write or call National-Standard.

NS NATIONAL-STANDARD Company NILES, MICHIGAN

NATIONAL-STANDARD COMPANY • NILES, MICHIGAN
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WORCESTER WIRE WORKS DIVISION • WORCESTER, MASS.
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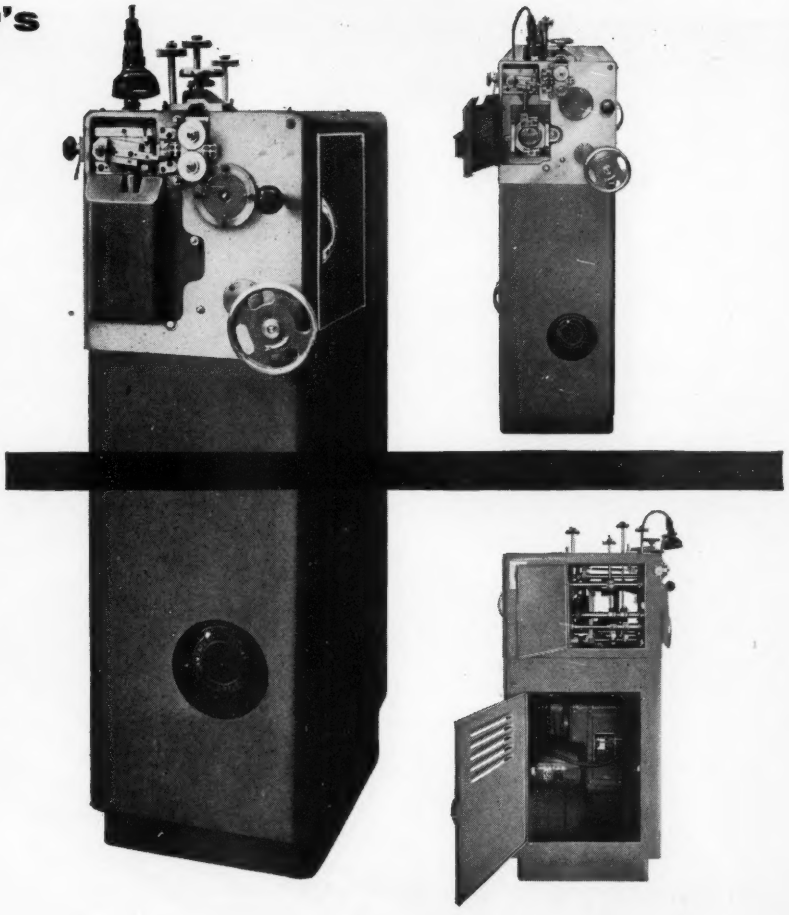
Based on the famous W-10 Spring Machine which has long been standard equipment throughout the industry, Torrington now offers the modernized W-10A Springmaker. This versatile, high-production machine includes many new features, all of which contribute to ease of set-up, correct location of controls, "clean" design and lower maintenance.

Read the specifications. Then call or write for further information on how the W-10A can be put to work in your plant to speed your production and reduce your costs.



SPECIFICATIONS

Wire Diameter Range	.008" to .028"
Wire Length Per Spring	0" to 24"
Coil Range (O.D.)	$\frac{1}{16}$" to $\frac{7}{8}$"
Production	24 to 243 with motorized variable speed transmission 21 to 240 with electronic adjustable speed drive
Drives	½ HP motorized variable speed transmission ¾ HP electronic adjustable speed drive
Extra Wire Feed Gears	0" to 36" of .008 to .024 diameter wire 0" to 48" of .008 to .020 diameter wire
Special Wire Feeds	0" to 6½" (using standard wire feed gears reversed)
Attachments Available	Torsion spring coiling mechanism, double diameter spring control mechanism, continuous coiling, 10 roll—2 plane-quick-opening ball bearing straightener, 5 roll—single plane—quick opening ball bearing straightener
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Wire Line Height	48"
Weight	695 lbs.

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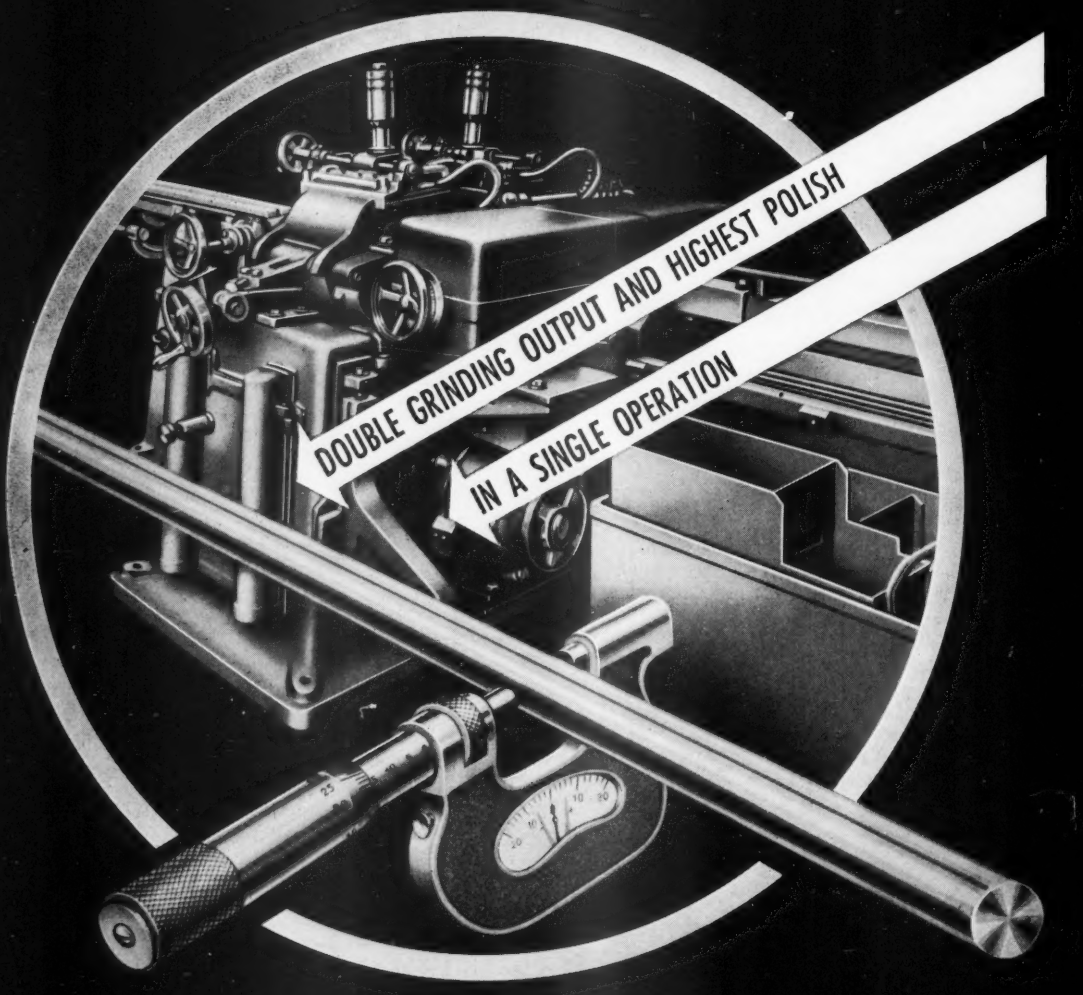
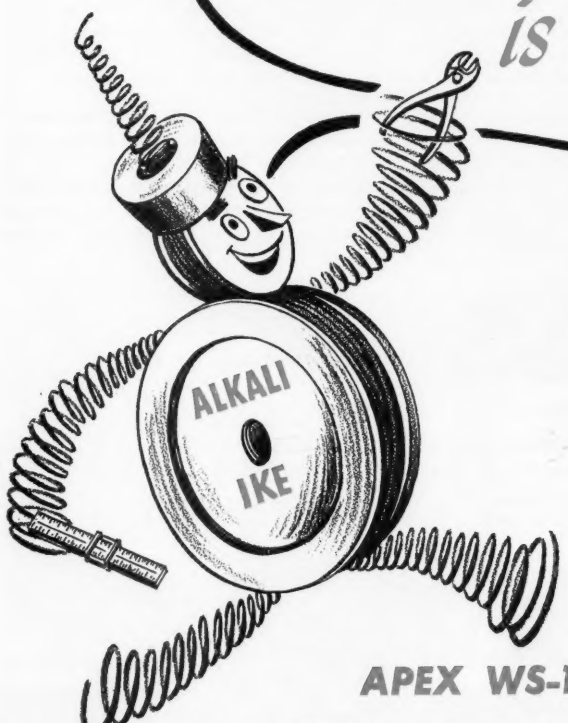
CENTERLESS BAR GRINDING AND POLISHING MACHINE



EXCLUSIVE REPRESENTATIVES FOR USA, CANADA & MEXICO
American Laubscher Corp.,
Fisk Bldg., 250 West 57th Street, New York 19, N.Y.

The only difference between a rut and a grave is the dimensions!



WE REALIZE THAT **in order to stay in business, we cannot allow ourselves to get into a rut. With our responsibility both to you and to ourselves in mind, we'd like to tell you about an entirely different type of Wire Drawing Lubricant.**

HERE'S A NEW FORM OF WET WIRE DRAWING LUBRICANT . . .

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- complete absence of copper soap formation
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- cleaner machines
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- minimum sludge formation
- less build-up on filtering or screening systems

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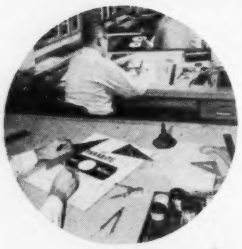

Art Design

Strength, safety of structure, simplicity, and style appeal—all these are factors which go into the tailoring of a spool for the job it must do. Clark flexible wire spools effectively combine these qualities in a variety of sizes, and are precision engineered to satisfy spool needs for insulated wire, automotive cable, radio and television wire, and wire solder.

Clark spools provide a continuous bond between the center and end. Reinforced by nibs impressed into the cap, this bond eliminates insecure assembly, or independent turning of the end, cap or center. Safety features that prevent wire from snagging or tearing include a full curl at the outer edge of the end, and a perfectly smooth surface at the juncture of the center and end. A sturdy, locked seam provides center rigidity, and eliminates buckling or bending.

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Colorfully attractive spool design—assuring instant brand identification and enhancing product salability—is done to your specifications by Clark's staff of specially trained artists. Lithographic decoration of unusual brilliance is made possible by rigid standards of quality control. Assembly requires simply joining the center and ends in a hand arbor, kick or power press. For economy of space and transportation, spools can be shipped in separate end and center units. Your inquiry will receive the prompt attention of a Clark sales representative, who will gladly send samples and full information.

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Lithographed Metal Containers

J. L. CLARK MANUFACTURING CO., ROCKFORD, ILLINOIS

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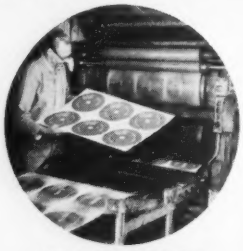

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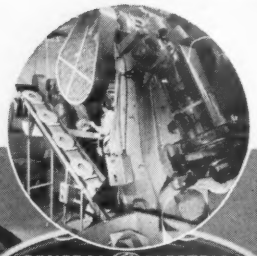

Spool Fabrication

Packaging and Shipping

Courtesy of Lake Erie Screw Corp., Cleveland, Ohio

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you need

Ajax-Hogue Wire Drawers

Here are the Advantages of Drawing Wire at your Headers

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INCREASES DIE LIFE of heading dies.

CLEAN AND PERFECT COATING - no scratches or scuff.

CONTINUOUS DRAWING Rod ends may be welded together.

• *Write for Bulletin No. 111-A* •

THE AJAX MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND 17, OHIO
110 S. DEARBORN ST. CHICAGO 3, ILLINOIS
DEWART BUILDING NEW LONDON, CONN.
W. P. WOOLDRIDGE CO., • BURLINGAME, CAL. • LOS ANGELES 22, CAL.

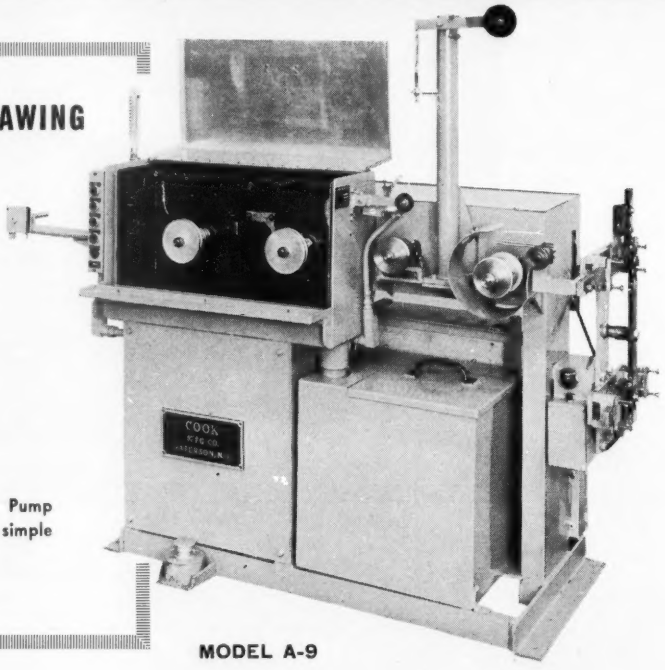
A Complete, LOW-COST WIRE MILL...

Model A-9 EXTRA FINE WIRE DRAWING

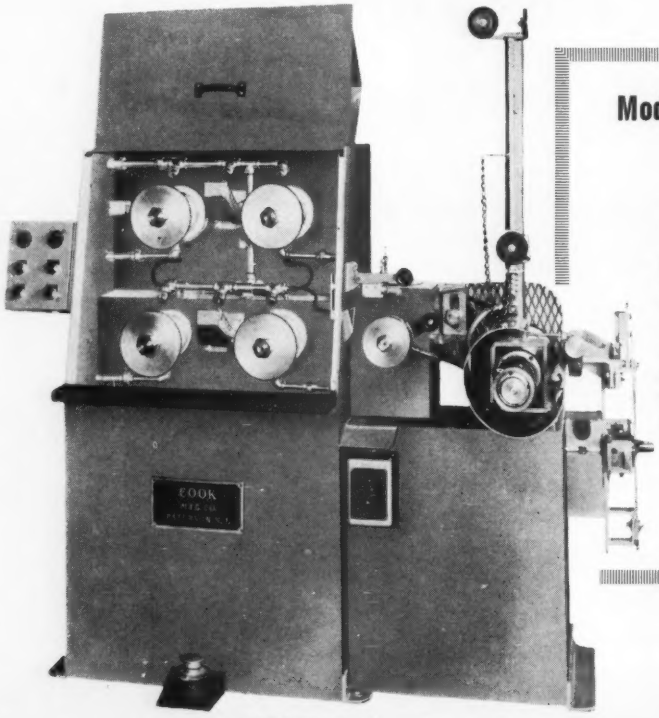
specifications:

Maximum Wire Entering Size	#24 B&S Gauge
Size of Finished Wire	#40-44 B&S Gauge
Average Operating Speed	3,000 ft./minute
Number of Dies	9
Maximum Die Case	1" x 3/8" thick
Number of Drawing Shafts	2
Motor Size (2-speed)	3 HP
Spool Capacity	10 to 15 lbs.
Spool Diameter	6"
Spool Traverse	4¾"
Floor Space	4'0" x 2'½"

- A complete package with Drawing Solution Pump and enclosed Solution Tank. An extremely simple string-up process.



MODEL A-9



MODEL F-31

Model F-31 MED-FINE WIRE DRAWING

specifications:

Maximum Wire Entering Size	#14 B&S Gauge
Finished Wire Size	#26 to 34 B&S Gauge
Operating Speed	5,000 ft./minute
Maximum Number of Dies	16
Number of Drawing Shafts	4
Size of Die Case	1" x ½" thick
Motor Size	15 HP
Spool Capacity	40 to 90 lbs.
Spool Flange Diameter	8" to 12"
Spool Traverse	6" to 8"
Net Weight	2,900 lbs.

Trouble-free, round-the-clock service.

PHONE INQUIRIES INVITED • ARMORY 4-6380

COOK MANUFACTURING CO., 50 EAST 25TH ST., PATERSON, N. J.

designed by COOK MFG. CO.

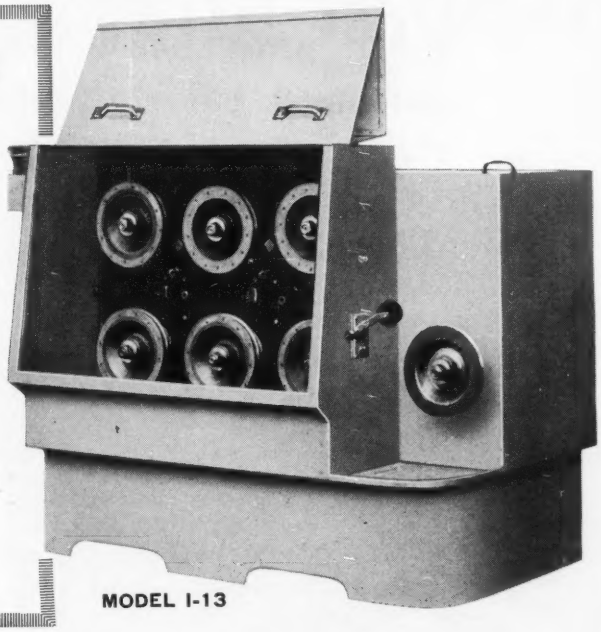
"draws out the best in wire"

INTERMEDIATE WIRE DRAWING MACHINE

specifications:

Maximum Size of Entering Rod	#8 B&S Gauge
Finished Wire Size	#18 to 26 B&S Gauge
Maximum Operating Speed	5,000 ft./minute
Maximum Number of Dies	13
Number of Drawing Blocks	6
Maximum Size of Die Case	1½" dia. x 1" thick
Spool Capacity	500 to 1,000 lbs.
Spool Traverse	11"
Spool Diameter	30"
Motor Size	75 HP

- All welded construction and built of heavy steel plate (as is all Cook Equipment.) Conveniently arranged dies permit quick and easy string-up. Main drive motor is coupled to machine.



MODEL I-13

The COOK Heavy Duty Rod Breakdown Machine, Model D-13

specifications:

Maximum Size of Entering Rod	5/16" Copper 3/8" Aluminum
Finished Wire Size	#8 to 16 B&S Gauge
Maximum Operating Speed	3,500 ft./minute
Maximum Number of Dies	13
Number of Drawing Blocks	6
Maximum Size of Die Case	1½" dia. x 1" thick
Spool Capacity	1,000 lbs.
Spool Traverse	11"
Spool Diameter	30"
Motor Size (maximum)	200 HP

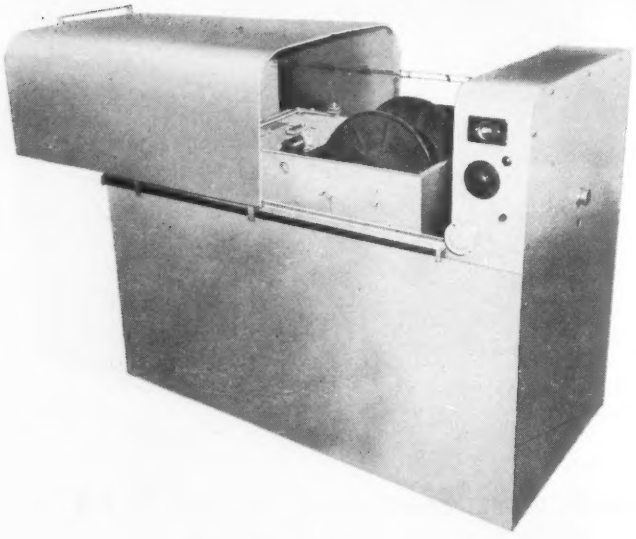
MODEL D--13

- **Our Engineering Dept. is at your service to assist you in the solution of your wire problems—at no obligation of course.**

designers and builders of quality machinery for the wire industry

ANNOUNCING *a New and Practical* HIGH SPEED BUNCHER

A high production Bunch-Strander equipped with automatic control features that provides new standards of quality in twisted wire products.



THE SERIES 8-16 BUNCHER illustrated at the left is designed to give *complete automatic control* of wire speed and tension.

FIELD TESTS HAVE RESULTED IN MINIMUM BREAKAGE AND DOWN-TIME — PLUS ACCURATELY BUNCHED WIRES.

FEATURES:

- **Variable speed 1.5 h.p., D.C. drive.**
- **Speed range of 0 to 900 RPM's.**
- **Flyer speed gives 1800 twists per min.**
- **Take-up reel controlled by disc-clutch.**
- **No hand adjustments necessary to compensate for size or weight of reel.**
- **Welded reinforced steel construction.**
- **Equipped with standard sealed ball bearings.**
- **Standard lay range: ½" to 3".**
- **Special lays to your specifications.**

There are many other desirable features that make this new bunching machine an outstanding engineering achievement.

Built for efficient, accurate and economical bunching. Designed and built by practical mill men for high production.

WRITE OR 'PHONE TO-DAY FOR COMPLETE DETAILS.

WIRE & TEXTILE MACHINERY, INC.

80 Fountain Street • Pawtucket, R. I.

Sole Sales Representatives for
ADVANCE MACHINERY CO., SYOSSET, N. Y.

CHECK THE ADVANTAGES OF STAINLESS STEEL FASTENERS

✓ for boosting product quality!

Where appearance and performance call for quality parts, don't overlook the advantages of stainless steel fasteners. Take the illustrated E. W. Ferry fasteners, for example. They're priced right in line with quality fasteners of other materials. Yet they offer all the extra qualities stainless steel brings to any part — high tensile strength . . . attractive, rust-resisting finish . . . and remarkable resistance to heat and corrosion. In almost any application they outlast, many times over, fasteners of nonresistant or plated metal. They cut maintenance costs, too. For even after years of service, disassembling rust-free stainless fasteners is always a fast, easy operation.

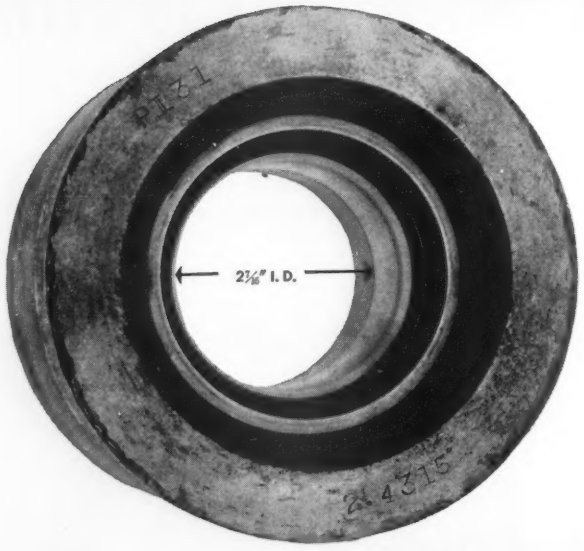
✓ for reducing production costs!

The hardness of stainless steel fasteners results in substantial savings on the assembly line. Work is faster, results are better — simply because stainless screw-heads are less apt to burr and nick. This means major savings, for even a slipping screwdriver can seriously damage both the screw and the parts being assembled. Stainless steel fasteners cut tooling costs, too. For they are now available in practically every size and description.

Crucible now offers stainless fastener wire in all diameters . . . in suitable tempers . . . in a variety of finishes, including bright and several metallic and nonmetallic coatings . . . in all standard grades. For prompt delivery of the stainless steel wire you need — or for your free copy of Crucible's new, 32-page catalog "Rezistal Stainless Steel Wire" — call or write to *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

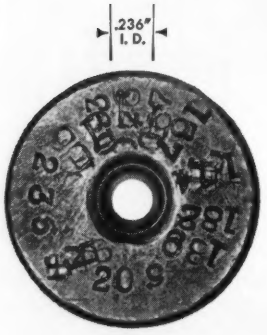
CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



Carboloy R-16 Die
operated 26 months
without polishing

Over 5,000 tons of steel were drawn by this R-16 die in 26 months . . . without developing an approach wear ring. During that time, the 2.4315" hole increased only .0025"—about one-tenth of 1 percent. (R-16 die shown one-half size.)



Carboloy R-3 Die
resized 20 times . . .
to 30% over maximum

Before its first resize, this R-3 die had already drawn more wire than its user expected on the first size. After its 20th resize, the die was still producing high-quality wire—with a hole 30% larger than normally recommended maximum. (R-3 die shown full size.)

THERE IS NO "NORMAL" SERVICE LIFE FOR CARBOLOY WIRE DIES

There's no such limit as "normal" service life with Carboloy® Wire Dies. Time and again, mill records prove these dies deliver far more than is expected.

Outperform other carbide dies

The R-16 die, at left, drew more than 5,000 tons of solid bar stock before it required polishing . . . breaking all previous carbide drawing records at Wyckoff Steel Company.

The story of the R-3, at right, is equally impressive in terms of effective service life. When the die was finally retired, the original .025" hole had been resized 20 times. The final .236" hole was 30% larger than the maximum .182" normally recommended—yet wire quality was maintained.

Get these "bonus" services

1. On-the-job engineering service
2. Immediate local delivery
3. Available die servicing facilities

Whether your business is drawing, flattening, extruding, or heading, there's a Carboloy product to fit your needs. For more information, or in-plant assistance, write today.

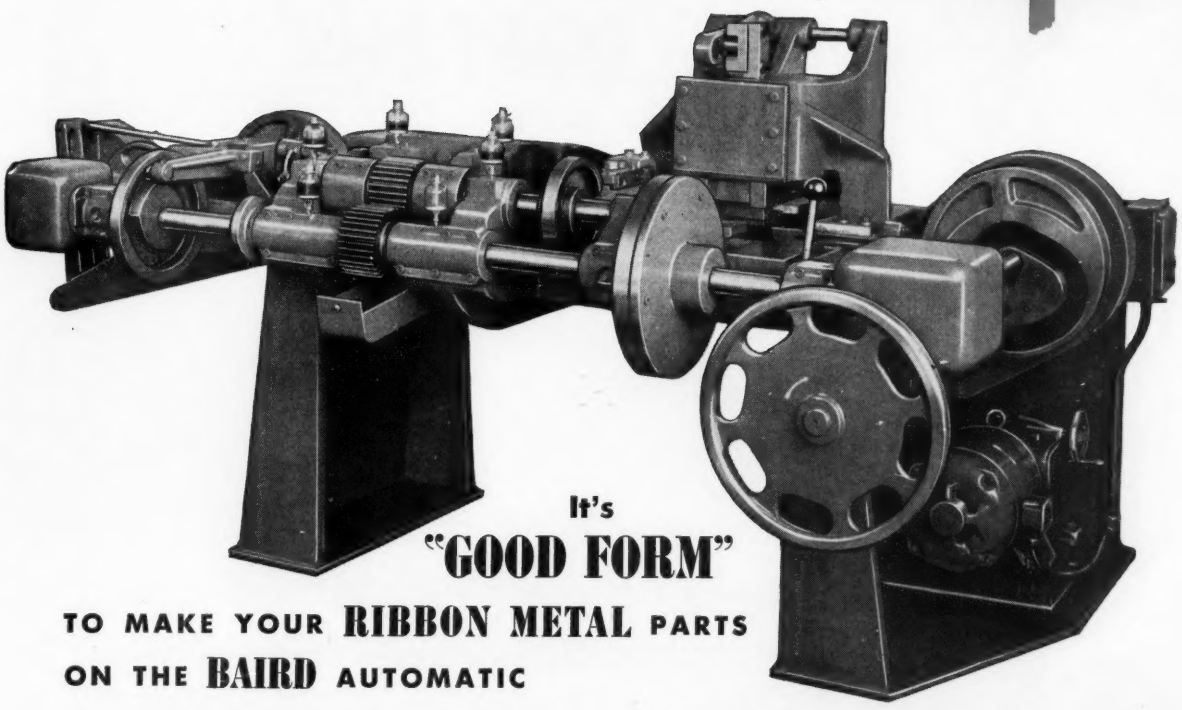
"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11171 E. 8 Mile Blvd., Detroit 32, Michigan

Carboloy Created-Metals for Industrial Progress

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT



It's

"GOOD FORM"

TO MAKE YOUR RIBBON METAL PARTS ON THE BAIRD AUTOMATIC

After completion of the tooling setup and adjustment of the several mecnanisms, you merely start the machine for fully automatic production.

Baird standard automatic Four-Slide Ribbon Metal Forming Machines are capable of producing thousands of shapes and sizes of products and components. In addition, various accessories, attachments, and special cams extend production possibilities to an uncountable quantity. The machine may be arranged to handle round wire if required.

Speed is the low-cost factor; smooth, reliable operation is another; also, easy access to tooling and inspection of work.

The story in detail is too long to present in this space, so you will want full particulars. This is the one machine you need to give you unusually fast and accurate production. "Ask Baird about it." Write Dept. WP.

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

1BA55

Your **DIES** last longer, too, with **DURPONS®**

We've stressed so often the fact that in wet drawing non-ferrous metals, Nopco Durpon Drawing Compounds last *twice as long*, and cost no more...you may have overlooked the fact that Durpons also mean *much longer life for your dies.* Which factor makes for the *biggest* saving, we hardly know. Both are well worth having.

The reasons for this long life are two: a buffer which prevents the breakdown of the emulsion, and a sequestering agent which keeps the bath *clean.* Try these money-saving compounds and see for yourself. Mail the coupon today.

"Stay Stable Longer"

DURPON—*for intermediate gauge wire*
DURPON L—*for heavy wire, rods, and tubes*
DURPON FW—*for fine wire*

NOPCO

PLANTS: Harrison, N. J. • Cedartown, Ga. • Richmond, Calif.

NOPCO CHEMICAL COMPANY
372 Industrial Street, Harrison, N. J.
Gentlemen:
Please send me a copy of your technical bulletin and a free trial sample of: DURPON ☐ DURPON L ☐ DURPON FW ☐

NAME_____

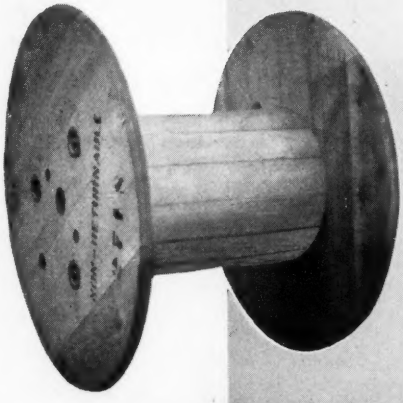
FIRM_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

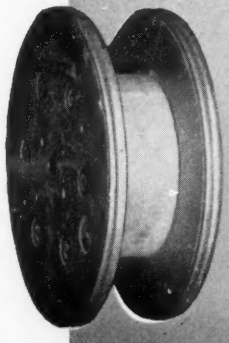
SAVE your company more!!!

SERVE your customers better!!!



the **NARCO**
NON-RETURNABLE

An expendable package — light in weight, soundly engineered and **LOW IN COST.** Save costly freight, expensive reel maintenance, valuable plant space. Serve without the inconvenience and expense of deposits to yourself **and** your customer.



the **NARCO**
METAL BOUND

A returnable package — lasts **FOUR TO SIX TIMES** as long as all wood reels. For applications where a non-returnable cannot be used. This durable reel requires no maintenance and is lighter than comparable all wood reels. Superior service and satisfied customers.

Remember — THESE ARE PRODUCTS OF THE MOST MODERN UP-TO-DATE REEL PLANT IN THE WORLD (MANUFACTURED BY A COMPANY WITH NEARLY 50 YEARS EXPERIENCE); A BACKGROUND OF EXHAUSTIVE TESTING AND RESEARCH IN THE LABORATORY AND THE FIELD.

WATERBURY FARREL
FOUNDED 1851

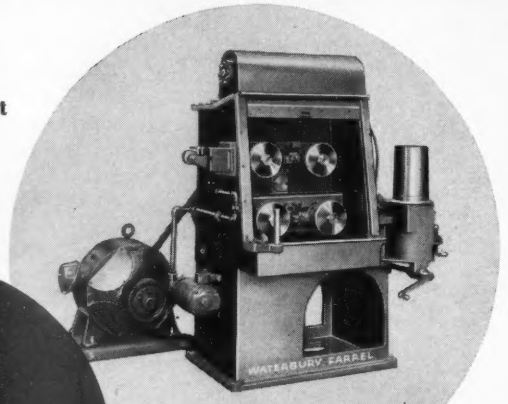
Custom-Engineered Upright Cone *Wire Drawing Machines*

★ **In 4 Sizes**

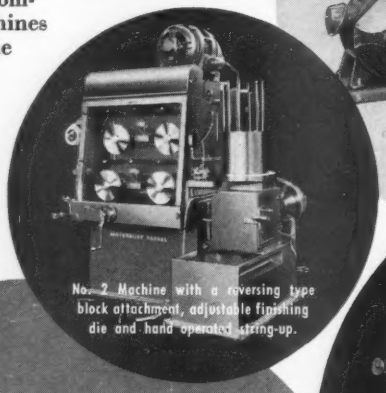
★ **With Drive, String-Up and Packaging Equipment To Fit *Your* Specific Requirements**

★ **And Precision, Quality Construction Throughout**

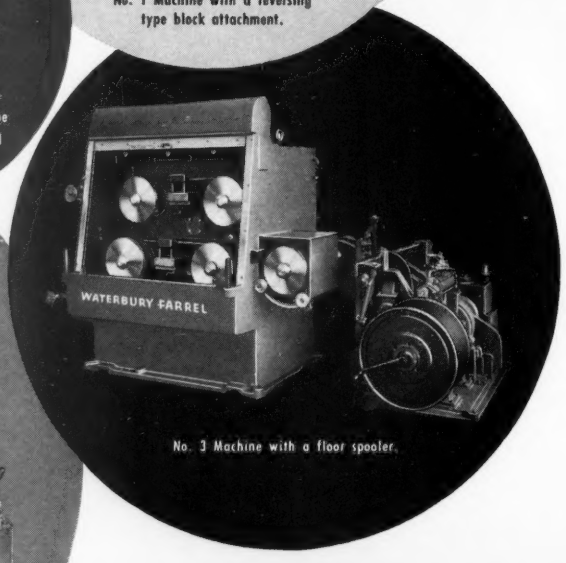
Here are four examples of Waterbury Farrel's long-proven ability to custom-engineer wire drawing machines for specific applications. The machine *you* need may call for another variation in design. For further information on the size and type of upright cone machine fitted to *your* exact requirements, contact Waterbury Farrel, today.



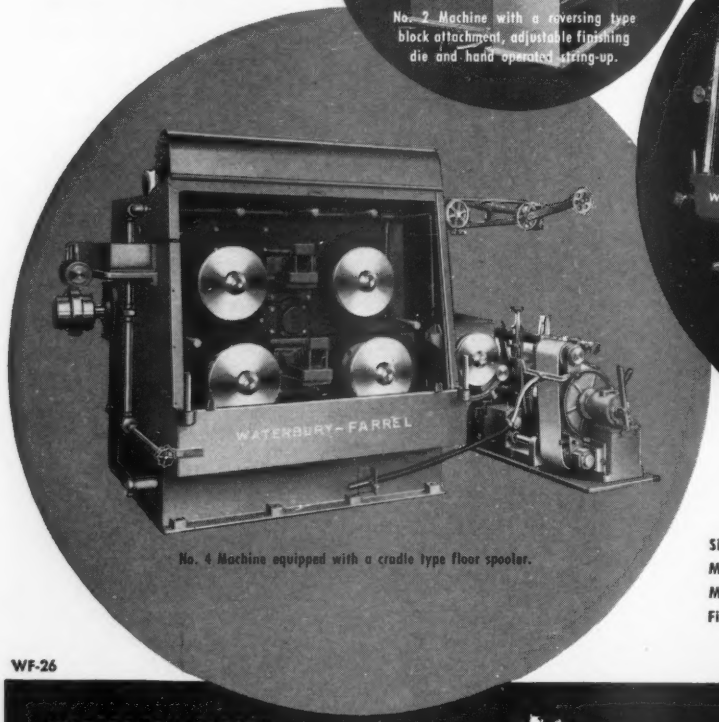
No. 1 Machine with a reversing type block attachment.



No. 2 Machine with a reversing type block attachment, adjustable finishing die and hand operated string-up.



No. 3 Machine with a floor spooler.



No. 4 Machine equipped with a cradle type floor spooler.

SPECIFICATIONS

Size of Machine	No. 1	No. 2	No. 3	No. 4
Max. No. of Dies	16	14	12	13
Max. Starting Size B & S	#14	#8	#4	¼
Finishing Sizes, B & S	#26 to #42	#20 to #34	#14 to #26	#12 to #18

WF-26

WATERBURY FARREL
FOUNDRY & MACHINE CO.
Waterbury, Conn. U. S. A.
Sales Offices: Chicago • Cleveland • Millburn, N. J.

Bolt, Nut & Screw Machinery

Power Presses

Rolling Mill Machinery

Sendzimir Mills & Other Special Machinery

Wire Mill Equipment

Are You Drawing
Copper Wire Directly
from .250" down to .0315"?

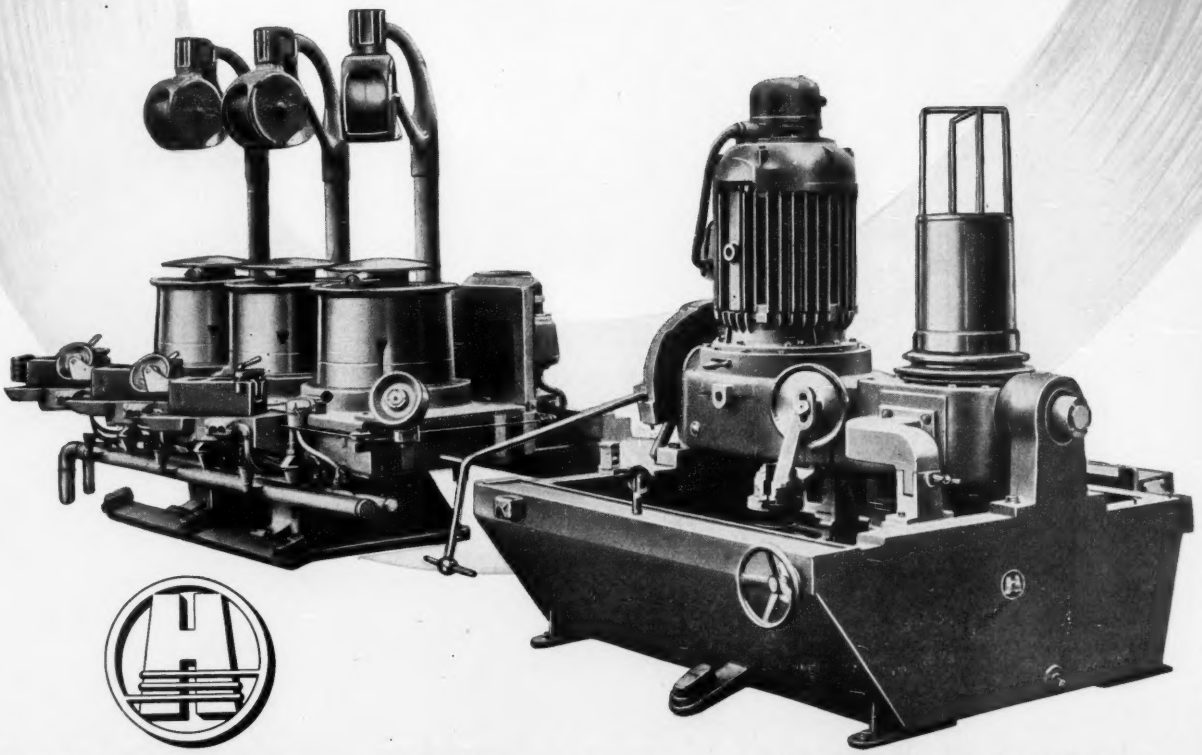
For this range, we recommend our

NON-SLIP/SLIP WIRE DRAWING MACHINE
MODEL G II/TF II D

The advantages of this combination of machines are as follows:

1) Drawing proceeds without interruption in one operation
2) Lower costs through combination of two operations
3) Finished wire with bright, flawless surface

Please submit your inquiries, we shall be glad to quote on your particular wire drawing problems.



MASCHINENFABRIK HERBORN BERKENHOFF & DREBES A.-G. **HERBORN/DILLKREIS**
GERMANY

Sole Representative in the U. S. A.:

KURT ORBAN CO., Inc., 34 Excha nge Place, JERSEY CITY 2, N. J.

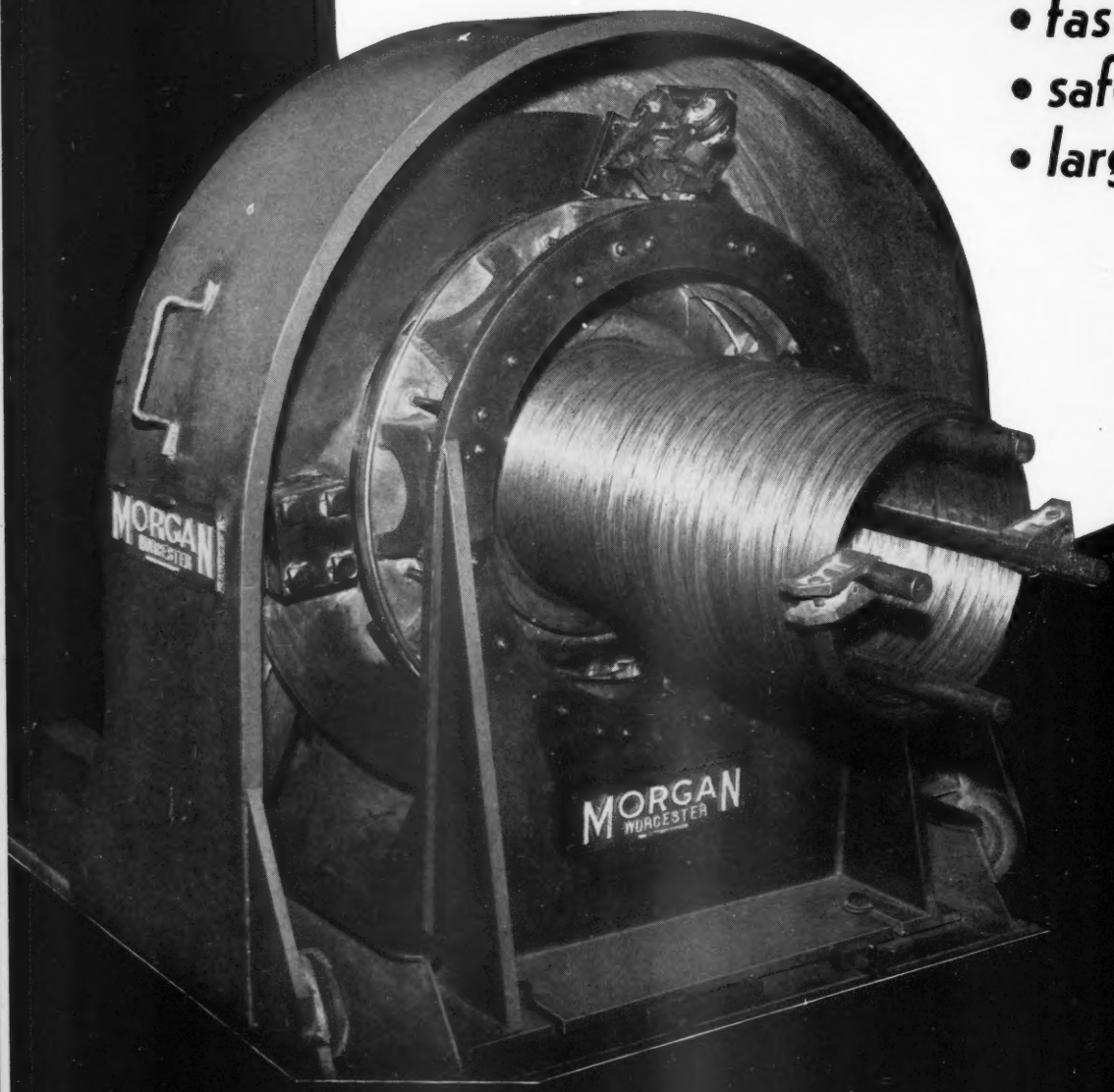
NEW!

THE MORGAN

DEAD BLOCK

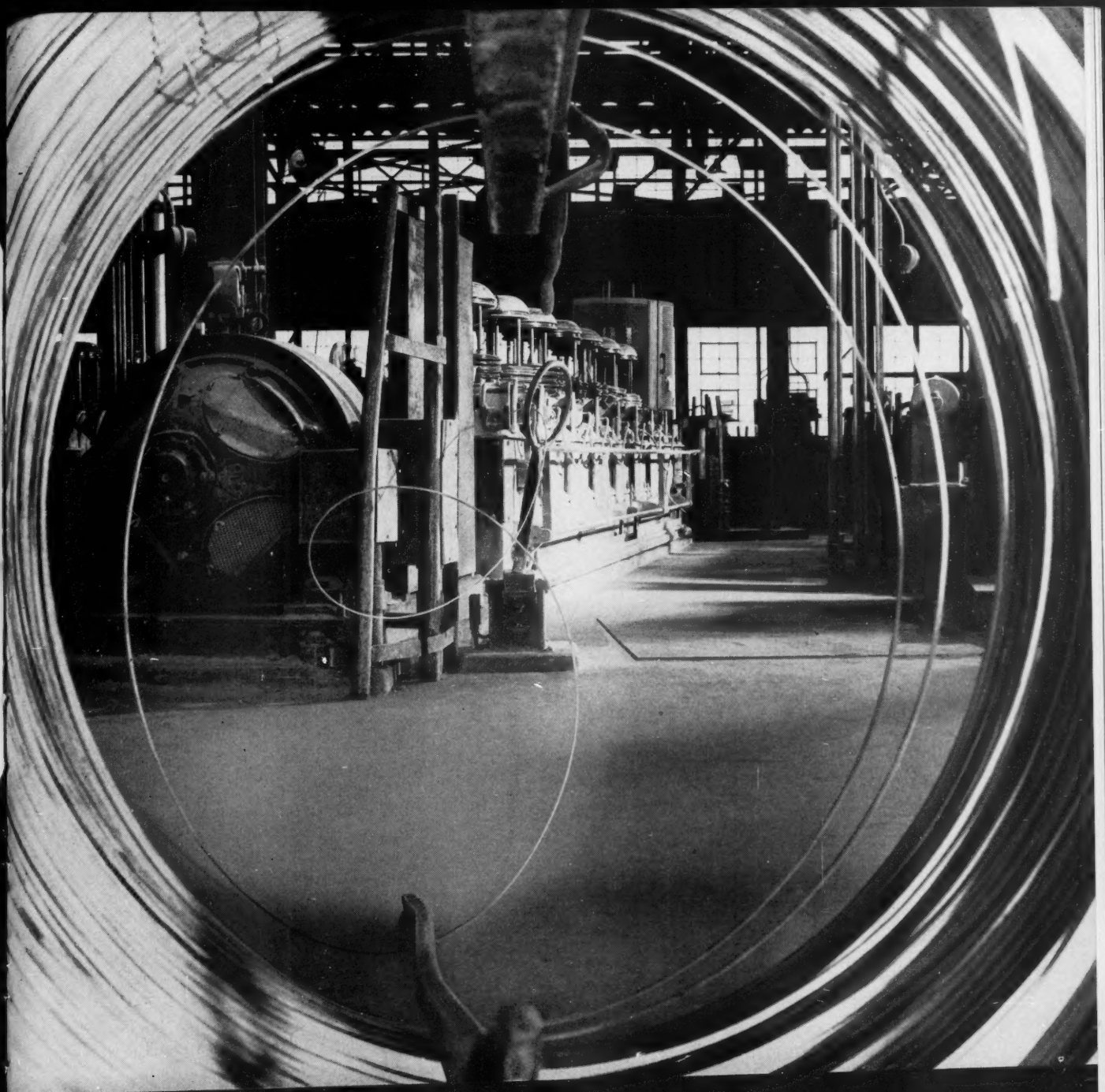
for non-stop wire drawing

- *fast*
- *safe*
- *large coils*



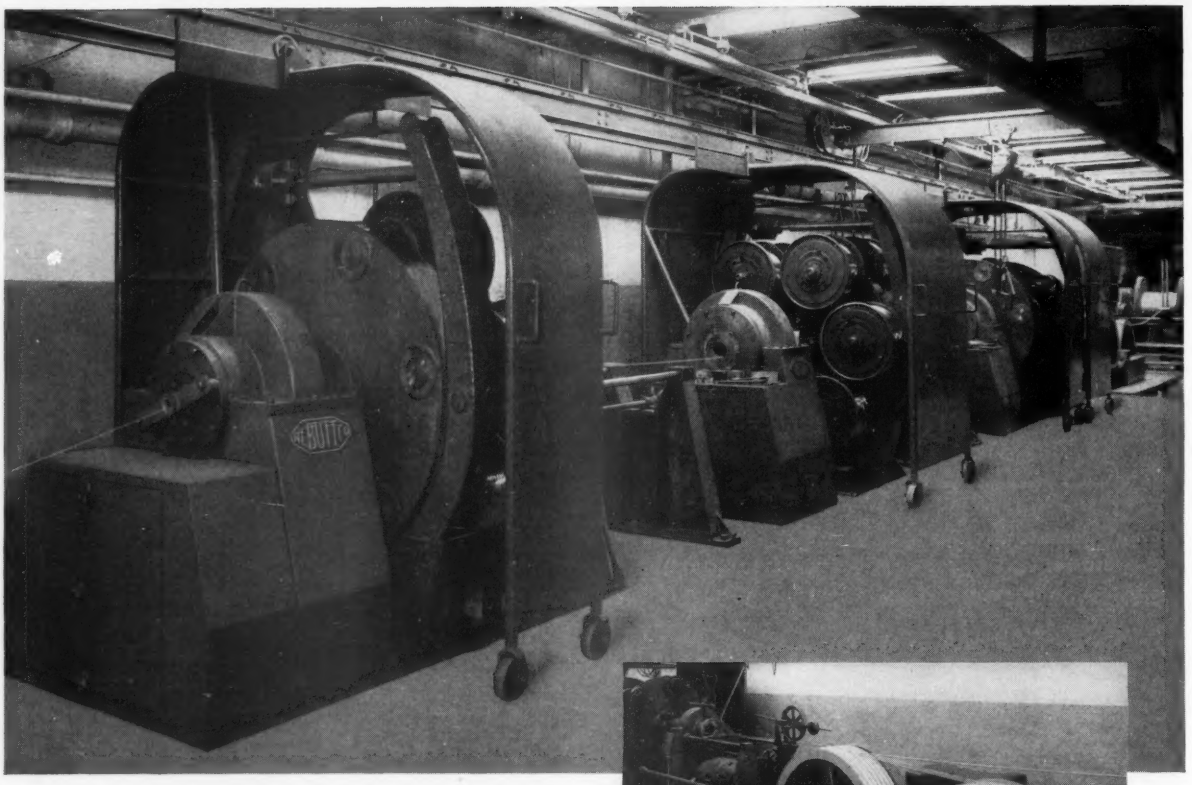
MORGAN CONSTRUCTION COMPANY

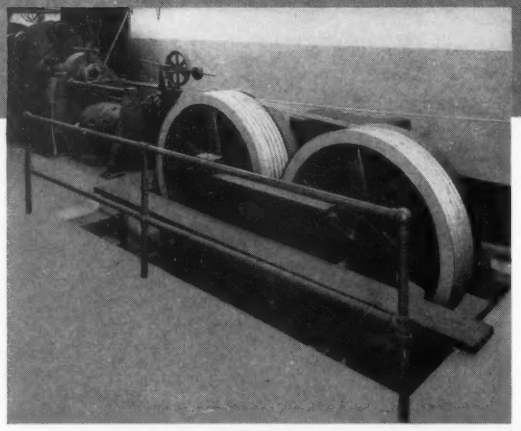
WORCESTER, MASSACHUSETTS, U. S. A.



Morgan-Connor

WIRE MACHINES





60" multi-groove capstans tilted for straight pull on cable without chafing. Both capstans are driven.

NEBUTTCO

RIGID STRANDER

Engineered with more than a century's manufacturing experience and ruggedly built for continuous, profitable operation, this high speed Strander requires minimum maintenance and produces high quality, uniform cables. All gearing is enclosed and guards are furnished as shown. The Strander is provided throughout with anti-friction bearings.

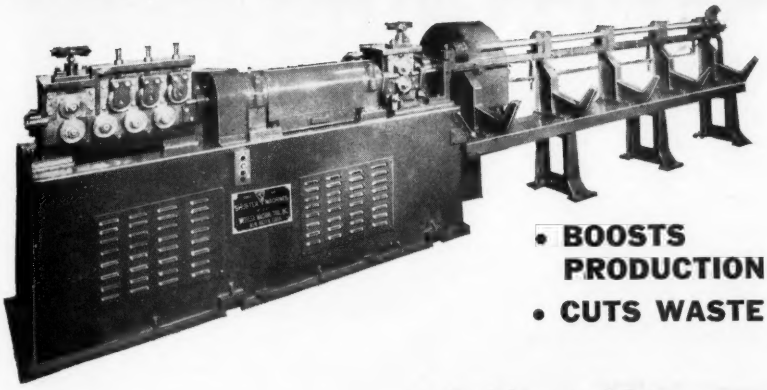
This machine has a capacity up to 37 wires and is supplied with 6, 12, and 18-reel heads. Any combination of spool heads can be supplied. Reels 22" diameter x 11" traverse are accommodated. Each head can be run independently in either direction or all heads can be run in unison in either direction at speeds up to 100 rpm. A speed of 120 rpm can be maintained on the 6-reel head.

For complete information and prices, contact New England Butt Company, 304 Pearl Street, Providence 7, R. I. or James Day (Machinery) Ltd., 28 Maddox Street, London W-1, England.

NEBUTTCO

BRAIDERS
CABLERS · TAKE-UPS
BUNCHERS · STRANDERS
TAPING MACHINES

CONTROL IS THE GOOD WORD from SHUSTER



- BOOSTS PRODUCTION
- CUTS WASTE

Dual Control 3AV — Straightens and Cuts ¼" to ½" diameter basic wire. Geared to feed 76 to 228 feet per minute.

Individual Control of Speed and Cut Off and Electrically Controlled Clutch and Target

With the Dual Control 3 AV you can run at the most efficient speed for the characteristics of the wire being used. And you get a clean cut at any length. Send for details.

A COMPLETE LINE

Constant Speed Machines are available for straightening and cutting wire from .025" to ½"

Constant or Variable Speed Units with electrically controlled clutch and target are available from 1/16" to ½"

Other variable speed machines may be furnished to straighten and cut wire up to 11/16"

ALSO

Slide Feed Straighteners ⅜" x 10"; 9/16" x 10"
Feed Starters maximum ⅝" diameter

Tube and Bar Straighteners 7/32" to ⅝" bar; 1" tubing

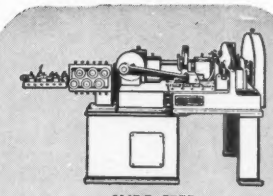
Reels for coils up to 300 pounds

Send for free, wall-size, split-gauge wire chart, from 41 gauge to 7/0.

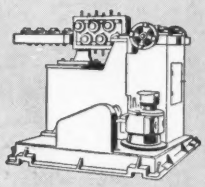
SHUSTER
Since 1866
METTLER MACHINE TOOL, INC.
155 West Adeline St., New Haven, Conn. • New York Office: 11 Broadway, WH 4-5480

SHUSTER

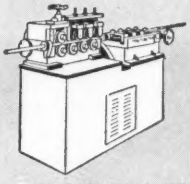
90 YEARS KNOW-HOW!



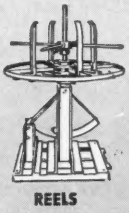
SLIDE FEED STRAIGHTENERS
3/8" x 10"; 9/16" x 10"



FEED STARTER AND STRAIGHTENER
Max. 5/8" dia.



TUBE AND BAR STRAIGHTENER
7/32" to 5/8" bar 1" tubing



REELS
400 lbs.

Gentlemen:

Please send us your recommendations. Our straightening and cut-off requirements are as follows:

.....

.....

Name .....

Firm .....

Street .....

City ..... Zone ..... State .....

For the FINEST Dies...

Specify

There Are Many Reasons Why V-R Leads The Field!

V-R NEW Cylindrical nib and improved method of assembly insure high degree of concentricity.

V-R . . . First in producing the only Tantalum-Tungsten carbide developed specifically for Drawing Dies.

V-R . . . First to manufacture Carbide Dies with preformed rough cored back relief.

V-R . . . First to furnish Carbide Dies rough cored to finish at hole sizes below .010".

WRITE TODAY for NEW Vascoloy-Ramet Die Catalog VR-461.

The New V-R Die Catalog gives complete ordering information on all V-R Dies for drawing wire, rod, bar and tube.

VASCOLOY-RAMET CORPORATION

The Wire Outlook

Predicting what will happen in the future is always a risky business. The unknown factors of the elements, changes in domestic government, in international relations or in the psychological attitudes of the people, all may alter what normally might be expected.

The best that can be done is to extend trends. Patterns of prosperity set in the latter half of 1955 should carry over into 1956, with the Gross National Product possibly higher for the new year as a whole. The first half may be a bit better than the second. Inventory building, started early in 1955, has continued through the year at an increasing pace. By June of this year, it is felt that industry inventories will have reached a saturation point and buying will then be curtailed to a point intended just to maintain them.

The resurgence of business that started in 1955 may be attributed in part to two important factors: confidence and credit extension. Confidence will remain as long as our government is thought by business men to be honest and fair. The policy of the Federal Reserve authorities is to loosen or tighten credit as circumstances make necessary, at all times endeavoring to keep credit within safe bounds.

In spite of the high levels of business anticipated this year, because of rising costs for which there will not be fully compensating increases in prices, profits are likely to be lower than in the year we have left behind us.

Corporate earning power has improved in the past three years in an atmosphere favorable to businessmen, but we are in an election year. Will the President run again? If he does not, will another party take up the reins of government? And how about the merged AFL-CIO if we have a change? Pretty likely to ride roughshod over the country and create conditions unfavorable both to profits and employment!

Stock market prices will probably be more realistic in 1956, but this need not be interpreted as weakness on the part of business. Some spots in our economy won't be as good. The automotive industry's output may be lower by a million units—but will still be high. Residential construction will be off, because of shortened credit terms, but this may be offset by higher commercial and industrial construction, plus the purchase of much new equipment.

It is now predicted that taxpayers will have 2.5 billions cut from their bills, which will add to the public's purchasing power, already booming along at unprecedented levels.

Copper is still short, but if current domestic production is maintained, it won't be too long before supply and demand are in balance. The aluminum industry, which has gone through a series of large expansion cycles, is finding it impossible to keep up with demand and a shortage is looked for all this year.

Spring and coil wire demand is heavy and wire for prestressed concrete reinforcement is showing up well. In fact, wires of all grades, except in fine sizes, are recording rising backlogs and forward buying is more general.

The wire industry in 1956 should show up even better than 1955, barring untoward developments that will reduce the wire rod supply. Wire rod production last year was over five million tons and may reach five and a half million in the current year. In 1954, rods produced totalled a little better than 4.5 million tons. Top production was achieved in 1951, during the Korean war, when 6 million tons were rolled.

Our industry is in good shape, through expansion and modernization projects, to meet all reasonable demands upon it and, from what is now observable, will be operating at or near capacity levels during the coming twelve month period.

A Happy and Prosperous New Year to all!

—from the Editor's Desk

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WIRE
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DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 31 January, 1956 No. 1

What Lies Ahead

by John H. Corson
Manager of the Laboratories
The Carpenter Steel Company
Reading, Pennsylvania

THE MORDICA MEMORIAL LECTURE FOR 1955

It is with a feeling of great appreciation to the Committee of Past Presidents of The Wire Association that I have accepted this honor.

★ ★ ★

I certainly never anticipated having this opportunity to present to you my thoughts on "What Lies Ahead" in the wire industry.

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Needless to say, I approach this moment with deep humility.

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The title of my talk is, "What Lies Ahead," and I believe it characterizes my overall association with the wire industry. In the main, my efforts are allied with the future instead of the events of the moment.

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This afternoon, I would like to pause from the fast pace of our existence, and consider what lies ahead. During this pause, I would like each one of you to let your imaginations wander with me.

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Imagination is a wonderful thing. Men, in particular, seem to be endowed with this capacity—more so, I believe, than the ladies. Men's minds appear to take two divergent trends. One is the Bikini bathing suit. What woman would ever have thought of that? The other is planetary space ship station in outer space. Every day this comes closer to becoming a reality. Yet, twenty years ago, these same ideas depicted in Buck Roger's comic strips were sheer fantasy.

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Imagination based on sound premises produces ideas which are the keystone to metallurgical improvements and mechanical advances in industry. This is a basic truth which has not always been accepted or utilized to its fullest extent. In years past, when the wire industry was comprised mainly of small, widely scattered plants, new ideas were not always well received; managements often ridiculed those who offered new ideas and suggested that the individuals would do well to stop daydreaming.

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In any industry there are exceptions, and in that dark era one bright exception was the man whom we honor every year at this time by the presentation of this lecture. John Mordica represented a light shining out of that darkness. His influence is present in this audience this afternoon because many of you, as close associates or as young men trained under his direction, illustrate the impact of his leadership.

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With the passing of time, many changes in thought patterns have occurred. High labor costs, unionism, high taxes and cost departments have actually forced managements to encourage progressive thinking and new ideas. This trend has advanced so far that some of the larger companies employ men whose sole occupations are the exploitation of ideas which might save either man-hours or materials.

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For instance, not too many years ago a metallurgist was a rather uncommon appendage to a wire mill. Before the arrival of this species, the foreman or super-

IN MEMORIAM

JOHN MORDICA
1873-1937

intendent supplied all the available knowledge. The weaknesses of this system were obvious. With the passing of time, it was realized that a man in this position could probably solve a lot of production problems which otherwise would never get solved, and just continue on as problems. Now the metallurgist is an established part of almost every wire mill — even many small ones. The complexities of many customers' problems are such that only metallurgists are in a position to deal with them.

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The metallurgist has also invaded the field of production to such an extent that even he does not have the time to develop new ideas and study problems that demand more than a cursory examination. So now additional personnel, called development metallurgists or project engineers, have entered the scene. These may be attached to engineering, metallurgical, or production staffs, depending upon the projects involved. With this metamorphosis in organization, many companies have attained a high degree of specialization. No one man can solve all the problems or make all the decisions. Under these circumstances, wire mill problems are solved by a cooperative effort of all concerned. In a way, the autocratic superintendents of industry have given way to the democratic committees of industry.

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The presence of many specialists in an organization is the basis for a highly-refined and a highly-geared development of new practices and products. Once the momentum of this specialization gets under way, it is hard to stop. The forces of competition will not let it stop. Each new product demands still a better product.

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The main theme of "What Lies Ahead" concerns what I believe will be a fundamental departure from our present concept of production methods. For our discussion, we must start from some sort of reference point, and in a general way, I would like to describe that point.

Departmentalization is the word which best describes the past and present philosophy of our production methods. By this, I imply that the entire production of the wire mill is broken down into several distinct and separate entities—each one of which is set up with its own complement of foremen, clerks, inspectors, tractor drivers, maintenance and production workmen. The entire effort is concentrated on doing a particular operation with the utmost efficiency. And nothing can interfere with that purpose.

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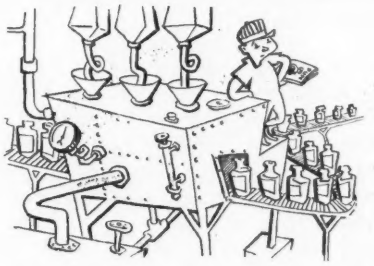
What I propose is this:

A complete departure from departmentalized production and the future acceptance of unified automatic methods. The last fifteen years have seen the beginning of this approach. In reviewing this span, it is obvious that every advance has involved closer mechanical and metallurgical control. When analyzed in another way, electrical and mechanical equipment now assume the responsibility and do the work that men used to do—and do it better—with less manpower. One word—automation—describes this trend. How often have we dreamed—(yes, that forbidden word again!)—about the possibility of producing wire untouched by human hands? Some industries, such as the bottling and packaging industries have accomplished this endpoint. The wire industry has made only a start.

John H. Corson

This lecture is delivered by a man who, in the opinion of the Board of Directors, has contributed in an outstanding manner to the advancement of the interests of the wire industry. An invitation to deliver the Lecture is the highest honor that the Board can bestow upon a member of The Wire Association.

The author graduated from Lehigh University in 1943 with a degree of B. S. in Metallurgical Engineering. After two years with the armed forces, he joined the Metallurgical Laboratory of the Roebling organization, working on welding techniques, continuous heat treatment of rods and the development of shaped wire drawing techniques. In 1946, he became Assistant to the President of the Maryland Fine and Specialty Wire Company, where he was concerned mainly with production. In 1950, he became a metallurgist for the Bethlehem Steel Company in the Williamsport plant doing wire mill metallurgical work and wire rope engineering. He entered the employ of The Carpenter Steel Company in 1952 as Plant Metallurgist and in 1954 was appointed to his present position there.



Oddly enough, now that management is encouraging automation, the unions, which once accused management of being slow to accept modern methods, are now taking issue with it. In the automobile industry, it is the new nasty word.

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Before going any further, it will be well to clarify what I mean by automation. In general, it encompasses any producing unit where several previously different operations are now considered as a single producing unit. The ultimate object is to produce wire from raw material to a finished product in a single unified operation. At this point, it would also be well to state that this concept will only apply to the larger tonnage items, or to items for which there is sufficient volume to justify a continuous operation.

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Within our memories of past history, there have always been a few unified operations. The predominant one is galvanizing of telephone wire, wherein subcritical strand annealing, acid cleaning, and hot dip galvanizing have been combined. Another is the continuous tempering of high carbon strip which includes heating to an austenizing temperature, quenching, drawing, cleaning, polishing, and even coloring. Oddly enough, these two unified operations were in existence for many years before additional progress occurred. The last fifteen years have seen the

development of other unified operations. One is the continuous patenting, cleaning, and coating of process wire in small sizes. To the best of my knowledge, some fifteen years ago the Johnson Steel & Wire Company designed and built such a unit. Needless to say, this was the envy of every other wire mill. Even as late as 1948, when I was first privileged to see the operation, it was still a unique development.

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Another unified operation which is being used to some degree is the combination of a mechanical scale breaker in tandem with a wire drawing machine. This development was started during the last war in France due to a scarcity of sulfuric acid.

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A third example which deserves our attention is a unified operation at the Maryland Fine & Specialty Wire Co. Here subcritical annealing, acid cleaning, copper coating and wire drawing of fine wire have been combined very successfully.

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Each of these examples is probably duplicated in many wire mills throughout the world. Each lends substance to the concept of automation, although none completely develops it to the ultimate goal. Aside from the thought that these unified operations are accomplished facts, it is well to note that on a chronological basis a greater progress has been made in the last fifteen years than in the last fifty. It is believed that progress in this field will be speeded up tremendously, and the ever increasing emphasis on reduction of costs will never permit it to slacken.

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I fully expect that in the future more and more papers delivered before this association will involve descriptions of newly installed automatic operations.

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Automation not only applies to actual production units, but to auxiliary operations, including sales departments, scheduling departments, mill clerks, transportation systems, and inspection departments. At first glance, one wonders how automation can be applied to those groups, but actually, they represent a most fertile field for this type of exploitation. Basically, each of these groups consumes time while producing nothing. Granted that their services are needed in some form, they do represent the hysteresis of our production units.

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How often have you heard about the week that it takes to get an order through the sales department? How often have you stood at a main thoroughfare of a wire mill watching the passing parade and asking yourself the question, "Are these trips necessary"? How often have you heard the statement, "We can't move that truck until we get an O.K. from the laboratory"? How often have you heard that "We can't ship that order because it is waiting to be inspected"?

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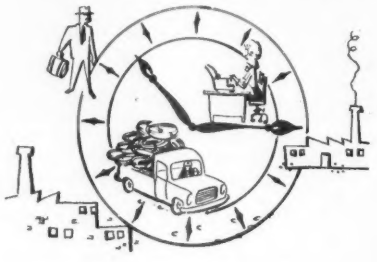
Each of you has not only heard, but asked these questions many times. Each of the incidents represents lost time. In our present-day existence, time has become a factor of the utmost importance.



Customers' demands for shorter and shorter deliveries have completely revised past patterns of production. Delays which were tolerated yesterday must be eliminated today. Each instance of our production hysteresis is being corrected in one fashion or another.

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The Aluminum Company of America has made tremendous strides in reducing the time for order entry. Not more than two years ago the changing aluminum market prompted the realization that better customer service—mainly shorter time from acceptance of an order to delivery—was the key to getting more orders. Accordingly, with the help of outside specialists in the field of paper handling methods, they have been able to reduce order entry time from four days to less than twenty-four hours. This accomplishment has involved teletype systems, a Flexowriter machine which types at the rate of 110 words a minute, common language tapes, and other new tools for expediting clerical work.

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The passing parade of people walking through our mills is the product, I believe, of lack of communication. Unless the persons are actually wasting time, they probably are on their way to see someone not easily reached by telephone. In some phases of our industrial life, this need has been solved. One example is found in industrial railroads, where short wave radio systems are used. Instead of an engine being lost somewhere in the plant, and the foreman walking everywhere trying to find it, the radio can find it in a moment, and give it its next instruction. Recently I saw short-wave radio in use even on tractors. Such systems have proved their worth by virtue of the fact that they are used universally.

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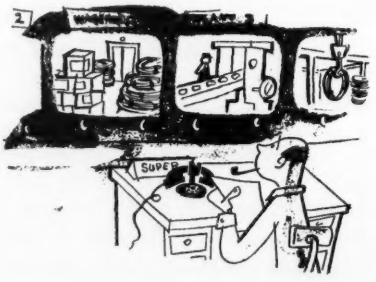
In recent years something new has been added to these short-wave radio stations, and that is television. In industry, television has just barely entered the scene. Oddly enough, it is being used extensively by the railroads—one of our most conservative members.



They are using it to control freight yard movements which are out of easy sight or completely hidden. This situation can be translated into our own wire mills.

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Imagine, if you will, a series of television cameras placed strategically around the wire mill with receivers in the superintendent's office, schedule clerk's office, and various foremen's offices. With this system, anyone can keep in complete contact with any part of the mill by changing channels. To complete this, of course, there will be microphones at each wire drawing bench or group of machines. Workmen then are in direct contact with the schedule clerks or foremen. With such a communication system, the passing parade of persons can be minimized to a great degree.

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Getting answers from the laboratory always is a problem. Most of you in the wire business are not too concerned with this problem. But to manufacturers of stainless, tool and alloy steel reports on microstructures for presence of precipitate in austenitic stainless steels, pearlite in carbon tool steels, or amount of decarburization, are of primary interest.

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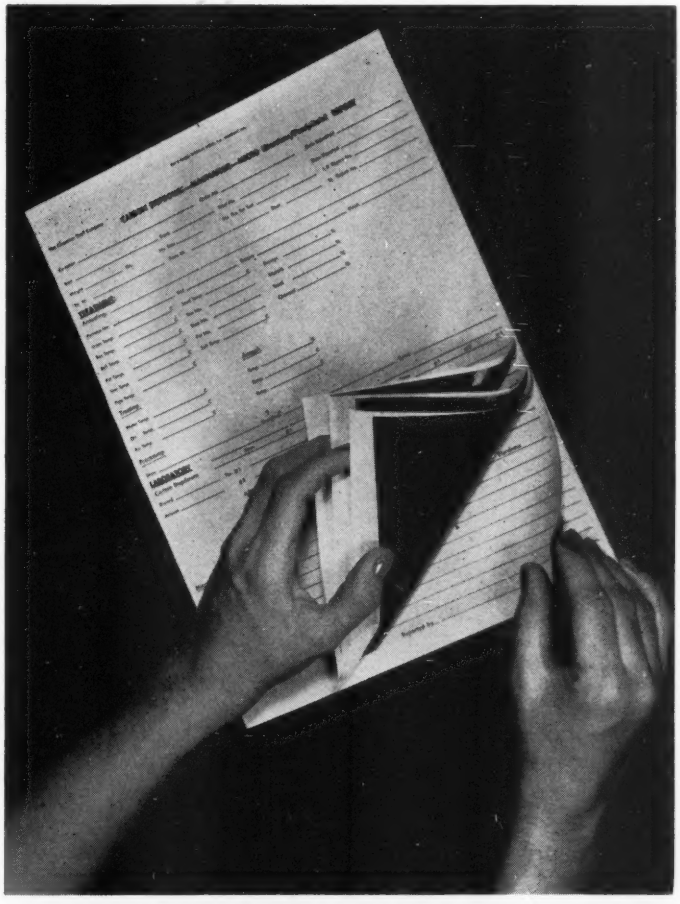
Until recently, our own laboratory was bogged down in reporting tests because secretaries would get a day or two behind in typing the results. An evaluation of the entire paperwork setup revealed that many short cuts were possible. A snapout form with six copies was devised. The mill clerk would initiate a form and write all the pertinent information. After tearing out the last copy, the test piece together with the other five copies would be sent to the laboratory.



The workmen performing the test involved would write in the results, which in turn would be checked by the foreman. At this point, the copies would be torn out and mailed directly back to the mill. Although the system is not as neat as typing, it gets the results back to the mill in short order, minimizing delays.

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Waiting to get steel inspected is a particularly annoying delay. The steel is so close to getting shipped that the desire to want to skip final inspection is overwhelming. With our customers demanding perfection in every inch of product, the need for inspectors has grown like a creeping paralysis.

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Fortunately, there is hope of not only stopping this disease but of turning back the tide. Although it is not the nice thing to say, the need for inspectors has grown, to some extent, due to an occasional shipping of substandard wire. This situation is being overcome because today the customers know almost as much about your product as you do.

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Therefore, the knowledge that you can't get away with slipshod methods discourages their use. More likely than not in the case of off-standard products, the producer will call up the buyer and inform him of the problem rather than ship the order and hope for the best.

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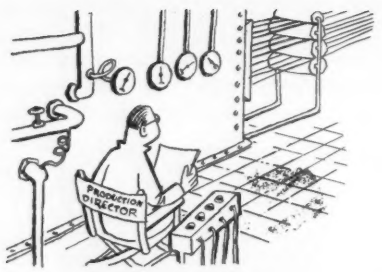
There is available today a tremendous array of devices which can inspect steel while it is being produced. In the case of wire, there are devices which can automatically gauge wire as it is be-



ing drawn. If it gets off-size, the machine shuts down automatically rather than continue to turn out coils of off-size wire. Other devices can indicate mixed stock—a perennial problem in our wire mill where some one-hundred completely different steels are being processed at any one time. I think there is no more embarrassing nor frustrating complaint than that of mixed steels.

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There is in a stage of development today, a device which will automatically record the depths of surface defects while wire drawing. This is particularly desirable for cold heading wire. I can foresee the day when cold headers will in some way demand that wire mills guarantee their product by the use of this type of inspection.

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The invasion of electronic equipment in the field of inspection will continue to speed up inspection and do a better job than present manual and visual methods. It is our only hope of eliminating inspection delays and reducing the need for an army of inspectors.

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There is one area of inspection which concerns me because of its archaic approach, and that is the testing of rope wire. Over the years, the entire process of manufacturing rope wire has been developed to a fine point. Yet our inspection standards have not changed. They represent a carry-over from the days before patenting was thoroughly understood, before the advent of continuous drawing machines, when stealing of passes was prevalent and water cooled dies were not employed. In wire mills with which I am familiar, the manufacturing practices are so highly developed that the percent of coils rejected for low torsions and off strength is amazingly low. It would seem that the requirements for testing one end of each coil in tension and torsion could be greatly relaxed. Although I realize that I am speaking of anarchy in the wire rope field, it is surprising that top managements have not insisted that wire rope engineers revise their holy standards in view of today's performance.

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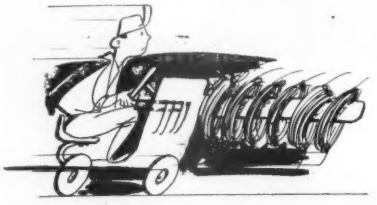
Two other groups which are closely associated and fit into this same category of production hysteresis are tractor drivers and weigh scale clerks. Although these



two groups will probably always be necessary, the need to transport and weigh each coil between every operation can be minimized by a unified operation. Basically, steel should be weighed only on coming into the mill in rods and on its way into the freight car as finished wire. In reviewing our transportation systems, the tractor has been a tremendous impetus in reducing handling costs, and speeding up the handling of wire. But why should we be content with this improvement when it is possible to minimize even this handling by the use of a unified operation?

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All of this discussion so far merely details one of the recognized facts of industrial life — that clerical and other auxiliary workmen have been increasing proportionately while actual production workmen have been decreasing in number. Irrespective of automation in production facilities, a concerted effort must be made, if it has not already begun in your company, to employ modern methods in the clerical phases of your operation. The incidents that I have related to you represent some first steps in attacking this problem. It is not hard to visualize that as equipment suppliers investigate this field, there will be a true industrial revolution in the clerical aspects of industrial life, just as there has been in the production aspects.

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As a partial summary, time and people are two factors in attaining the ultimate goal of low-cost, yet high speed, production. Economical and efficient use of both must be attained. It must be realized that the standards by which these two factors have been judged in the past must be re-evaluated in light of today's competition, and the use of equipment which can eliminate the delays normally encountered when human beings do the work.

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And now, we must turn to the third phase of this subject of automation, and that is its possible application to wire mill production. This subject has interested me for the last several years. I have honestly wondered, where do we go from here? This question has raised itself repeatedly during the various mill visits which we all make in connection with Wire Association conventions.

★ ★ ★

Looking back fifteen or twenty years, wire mills looked very much alike. In this period practically all the wire drawing facilities consisted of long benches of single blocks all driven off a common drive shaft. Handling of coils was all manually done. Pickling departments generally were constructed in a semi-circular fashion with a steam crane servicing them. Bakers consisted of huge, low temperature ovens which were slow in operation, inefficient, and required a lot of manpower to operate.

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Then came an engineering design revolution primarily started by the tungsten carbide dies. Soon every wire mill was trying out a continuous wire drawing machine which took advantage of the car-

bide die. The old costly methods of handling came under close scrutiny. Then the gasoline or electric powered tractor arrived. Cleaning houses became mechanized with the development of the straight line operation. Each of these changes reduced costs so much that companies had to buy the modern equipment to produce wire competitively. It was either sink or swim. And so, as you all know, the gradual change to modern equipment is nearly completed throughout the industry. Again, we have uniformity. True, there are slight differences in design from one mill to another, but fundamentally, the outcome is the same.

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The improvements noted today are not revolutionary, but represent refinements in equipment and processing. I refer to the high blocks for permitting a buildup of wire for maximum cooling between dies. These and other refinements have brought the industry to the end of an era of engineering development.

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Some of the items which characterize the end of the era are as follows: The speed of drawing wire has almost arrived at its limit due to the present capacity of the tungsten carbide die. Until some one develops a better die, there is no need to go faster.

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Even drawing into large coils has been reasonably well exhausted. The 1500 lb. coil is about as large as it is feasible to handle. Close control of acid concentrations, acid temperature, inhibitors, and iron content has been refined to the point where acid cleaning costs are reduced to a reasonable minimum. Patenting of high carbon steel rods has been studied, and the maximum speeds at any one operating temperature for a particular length of furnace are well known. The only hope for faster production is to go to longer furnaces which even now have a length of 60 feet. But furnaces can get only so long before other economic considerations will dictate that they should be no longer.

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That the end of an era has been reached is also reflected in a series of articles by Mr. Davidson* in the English magazine "Wire Industry". In this series, the theory of high speed continuous drawing of wire is repudiated for slower speed wire drawing in large coils by the use of the gravity drawing block. This system may have its merits, but to me it indicates an effort to reach out for a new philosophy of operating a wire mill. Realizing that speed and size have been exploited to the fullest extent, they are now back-tracking and trying a new approach.

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As you all know by now, I believe that the next phase of development of the wire industry lies in automation. A start in that

field has already been made in a limited fashion. I would like to describe for you the automatic wire mill of the next fifteen to twenty-five years. I trust that you will let your imaginations soar, and not be too critical of details. The ideas which I offer to you this afternoon will certainly require revision, but I hope you will consider the basic philosophy behind them.

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First of all, let us start with a discussion of high carbon rods and a prediction that patenting of rods, at least for break-down purposes, will be past history before many years. In this country, on an experimental basis, .75% carbon rods, passed through a special quenching apparatus on the rod rolling mill, can be drawn 85% total reduction to process patenting sizes on high speed drawing machines. On the continent, experimental work indicates that coiling hot rolled rod into molten salt baths also accomplishes the same end-point.

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Acceptance of this development is not far away, and this is but a short step to producing high carbon rods, as hot rolled, with a sufficiently uniform microstructure and physical properties, to be drawn into acceptable rope and spring wire.

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The possibilities that exist in eliminating that costly, time-consuming patenting operation are enough to whet anyone's interest in this subject. So for our discussion, we will consider that the rod patenting operation need not be a separate one, but will be accomplished as a part of the rod rolling.

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The next dream all of us have enjoyed for a long time is a combined cleaning, coating and wire drawing operation. This has already been accomplished in the case of fine sizes of low-carbon wire, as has been indicated. Our problem is to accomplish this on the common rod sizes — particularly on high-carbon patented rod. The first efforts in this area included the use of the scale-breaker in tandem with a wire-drawing machine. This combination has worked quite well for breaking down rods into process sizes — particularly where it has been possible to stay away from double-deck blocks which do not permit sufficient cooling between dies. However, for finish spring wire, for example, the wire doesn't have the proper coating for the subsequent forming operations.

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Within the past year a process for copper coating of stainless steel was patented. I would like to describe this patent for you, and then translate it into the first step of an automatic setup for our future wire mill.

(*Please turn to page* 78)

* Speed of Economic Production November (1934) THE WIRE INDUSTRY

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The Story of The Twenty-Sixth Annual Convention of The Wire Association

by Edmund D. Sickels, Editor
Wire and Wire Products
Stamford, Connecticut

The Annual Convention was held in 1955 in Chicago, Illinois, at the La Salle Hotel on November 14th through the 17th.

★ ★ ★

"Bigger and better" is hardly sufficient to characterize this highly satisfactory Convention, which was packed with papers and features of exceptional interest and value.

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Attendance climbed again, as evidenced by 607 registrations, as against the 1954 registration figure of 570. The registration included people from such far points of the globe as England, Germany, Norway, Sweden, Belgium, France, Spain and Australia, to say nothing of the usual large attendance from the Canadian provinces.

The Directors' Meeting

This semi-annual meeting of the Board of Directors of the Association was called to order at 10 A.M. on Monday, November 14th, with **Leslie C. Whitney,** President, presiding.

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Mr. Crewe, as Chairman of the Nominating Committee, presented the following slate of officers to serve from November, 1955 until the annual meeting in 1956:

President: LESLIE C. WHITNEY
Vice President: TOM M. GIRDLER, JR. (Ferrous Div.)
Vice President: BENOIT J. SIROIS (Non-Ferrous Div.)
Secretary-Treasurer: RICHARD E. BROWN

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On motion, duly seconded and put to a vote, the above officers were elected.

Those directors who were re-elected were formally seated and in addition one new director, **Donald C. Duvall,** Works Manager, **Pittsburgh Steel Company,** Pittsburgh, Pa., was also seated.

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Among other items of business transacted was the appointment of the following committees:

By-Laws Committee
Chairman: ALLAN B. DOVE
Members: FRED M. CRAPO
JOHN L. SANDERSON
BENOIT J. SIROIS

Committee on Conduct of Future Regional Meetings
Chairman: TOM M. GIRDLER, JR.
Members: EARL R. POTTER
S. RAY SNOW
JOHN L. SANDERSON
LEONARD C. CREWE, JR.
RAYMOND S. WORTH

1956 Program Committee
General Chairman
CHARLES H. WILLIAMS, JR.
Supt., Wire Mills, Pittsburgh Steel Co., Monessen, Pa.

Ferrous Program Chairman
WILLIAM MOHR
Wire Mill Supt., The Colorado Fuel & Iron Corp., South San Francisco, Cal.

John A. Moritz, Jr., General Program Chairman

Non-Ferrous Program Chairman
HUGO W. BISKEBORN, Director of Mfg., The Ansonia Wire & Cable Corp., Ansonia, Conn.

Medal Award Committee
Chairman: David M. SCHMID, Pres. Techalloy Co., Inc.; Rahns, Pa.

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The Board of Past Presidents submitted the name of **Kenneth H. Davis,** President, **K. H. Davis Wire and Cable Corp.,** Los Angeles, Cal., for the honor of delivering the Mordica Memorial Lecture in 1956, which was unanimously approved by the Board of Directors.

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Reports on coming meetings were made, the following meetings being approved for 1956: Regional Meeting in Kansas City, Mo., on May 24 and 25, with headquarters at the Hotel Muehlebach; Regional Meeting in Los Angeles in June; Annual Convention in Pittsburgh, Pa., October 29 through November 1, with activities centered in the William Penn Hotel.

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Votes of appreciation of the Board to the New York Regional Meeting Committee and the Pacific Coast Meeting Committee were duly recorded, both being meetings held in 1955.

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The meeting was adjourned at 12:30 P.M.

The Directors' Luncheon

This annual affair, in which the Directors entertain the program and meeting chairmen and speakers, is always a pleasant prelude to the official opening of the Convention.

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Following the luncheon, Presi-

dent Whitney welcomed the program participants and expressed his appreciation of all the work that had gone into the preparation of papers and other Association activities.

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He then introduced the General Program Chairman, **John A. Moritz, Jr.,** who greeted the Directors and Officers and extended his cordial welcome to the speakers and program committees, particularly voicing his sincere appreciation of the generous help he had had from everyone concerned.

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Mr. Moritz paid a warm tribute to **Stewart S. Gray** and **Benoit J. Sirois,** respectively Ferrous and Non-Ferrous Program Chairmen, for their diligent efforts in gathering together so many fine technical papers and welding them together into an organized program.

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He also commented on the willingness of the corporations that comprise our industry to allow their men to take the time to prepare and give the papers, noting that this method of revealing and exchanging technical information had contributed greatly to the advancement of the industry's welfare and helped to keep our mills on a high level of technological efficiency.

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Following the adjournment of the luncheon, the technical sessions were immediately started.

The Ferrous Section Technical Sessions

Monday, November 14th

2:00 P.M.—The Ferrous Program opened with a Symposium on Production Scheduling Based on Inventory Control, with **John A. Moritz, Jr.,** President, **Standard Industrial Compounds Co.,** Chicago, Ill., serving as Meeting Chairman. Various phases of the subject were treated by the panel members: **John L. Sanderson,** Supt., Wire Mills, **Keystone Steel and Wire Co.,** Peoria, Ill.; **L. W. Hackley,** Director of Production Planning, **American Steel and Wire Div., U. S. Steel Corp.,** Cleveland, Ohio; **T. W. Harman,** Manager of Order Service and **J. C. Farrell,** Asst. Manager, **Union Drawn Steel Div., Republic Steel Corp.,** whose statement was read by **Tom M. Girdler, Jr.,** Assistant Division Manager of the same company; **C. M. Wilbur,** Production Control Dept. of **International Business Machines Corp.,** Endicott, N. Y.; and **A. C. Morse,** Chicago Mgr., **Remington Rand, Inc.,** Chicago, Ill.

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The Symposium proved to be timely and interesting and resulted in discussions that are reproduced elsewhere in this issue.

Tuesday, November 15th

9:30 A. M. — Theodore B. Dull, Supt., Wire Mill, **Sheffield Steel Div., Armco Steel Corp.,** Kansas City, Mo., occupied the chair for this session, at which three technical papers were presented. These were "Electronic Measurement of Hot Rolled Wire Rod" by **Charles D. Gibbs,** Sales Manager, **Industrial Gauges Corp.,** Englewood, N. J.; "Advantages of Phosphating in Fastener Forming" by **John Geyer,** Manager, Development Div., and **Hugh Gehman,** Asst. Manager, **American Chemical Paint Co.,** Ambler, Pa.; and "New Type Plating Barrel for Automatic Handling of Large Batches" by **N. Ransohoff,** Chairman of the Board of **N. Ransohoff, Inc.,** Hamilton, Ohio.

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2:00 P. M. — Harry B. Matzen, Jr., Supt., **Union Drawn Steel Div., Republic Steel Corp.,** Hartford, Conn., acted as chairman of this session, which included three papers, as follows: "Wire Descaling in Germany" by **Dr. Alfred O. Koegel,** Manager, **Westfalische Drahtindustrie,** Hamm (Westf.), Germany; "High Convection Annealing for Wire Coils" by **James L. Whitten,** Vice Pres., **Lee Wilson Engineering Co.,** Cleveland, Ohio; and "Plastic Coating of Steel Wire" by **Joseph Beegle, Hauger - Beegle Associates, Inc.,** Chicago, Ill.

Wednesday, November 16th

9:30 A.M. — The Chairman of this Session was **W. R. Cook,** Supt., Wire Mill, **Union Wire Rope Corp.,** Kansas City, Mo. The three papers presented were: "A Practical Psychological Approach to Quality Control" by **Glenn R. Lee,** Supt., Wire Dept., **Continental Steel Corp.,** Kokomo, Ind.; "Factors Affecting the Characteristics of $Ca(OH)_2$ in Suspension, with Special Reference to the Wire Industry", by **Thomas C. Miller,** Technical Director, **National Gypsum Co.,** Buffalo, N. Y.; and "Stress Corrosion and Relaxation of High Carbon Steel Wire for Prestressed Concrete" by **Dr. Fritz Schwier,** Chief Engineer, **Felten and Guilleaume Carlswerk,** Koeln - Muelheim, Germany.

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All recorded discussions for the Ferrous Section Sessions are printed elsewhere in the January, 1956, issue of Wire and Wire Products.

Non-Ferrous Section Technical Sessions

Monday, November 14th

1:30 P.M. — The Non-Ferrous Sessions got under way Monday afternoon with **Charles M. Frederickson,** Staff Development Engineer, **Kaiser Aluminum & Chemical Corp.,** Newark, Ohio, serving as Chairman of the Meeeting. Five papers were presented, namely: "Progressive Work Hardening and Reannealing of Five Brands of High Conductivity Copper" by **M. V. Yokelson,** Research Metallurgist, **General Cable Corp.,** Bayonne, N. J., and **M. Balicki,** Professor of Metallurgical Engineering, **Polytechnic Institute of Brooklyn,** Brooklyn, N. Y.; "Effect of Cold Reduction on Some Properties of Nickel Wire" by **G. A. Nelson,** Supervisor, Engineering Service, **Sylvania Electric Products, Inc.,** Warren, Pa.; "Drawing and Processing of Titanium Wire" by **Douglas H. Wilson,** Production Dept., **Rem-Cru Titanium, Inc.,** Midland, Pa.; "Ductility Tests for Electrical Conductors" by **Louis Boleraski,** Research Engineer. **Kaiser Aluminum and Chemical Corp.,** Spokane, Wash.; and "Wax Lubricants in Non-Ferrous Wire Drawing" by **John Werner,** Field Engineer, Industrial Products Dept., S.

C. Johnson & Son, Inc., Racine, Wis.

Tuesday, November 15th

9:00 A.M. — Willard de C. Crater, Manager, Vinyl Sales, **Naugatuck Chemical Div., U. S. Rubber Co.,** Naugatuck, Conn., acted as Meeting Chairman. Four papers were read, to wit: "The Treatment of Copper Conductors in High Velocity Recirculating Type Gas-Fired Ovens" by **Charles A. Windsor,** Manager, Wire Equipment Div., **Michigan Oven Co.,** Detroit, Mich.; "Solution Coating of Copper Wire" written by **Cyril A. Litzler,** Pres., **C. A. Litzler Co., Inc.,** Cleveland, Ohio, but presented in his absence by **H. L. Bullock** of his company; "Recent Developments in Polyethylene Insulating Materials" by **R. J. Lurie** and **J. A. Snyder,** Development Engineers, **Bakelite Company,** New York, N. Y.; and "Accelerated Heat Aging of Polyethylene" by **W. W. Spohn** and **S. P. Foster,** Development and Service Section, **E. I. du Pont de Nemours and Co.,** Wilmington, Del.

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1:30 P. M. — Hugo W. Biskeborn, Director of Manufacturing, **The Ansonia Wire and Cable Co.,** Ansonia, Conn., was the chairman of this session, at which four papers and a movie were presented. The papers were: "Mineral Insulated Metallic Sheathed Cables" by **G. S. Eager, Jr.,** Ass't. Director of Research and **S. P. Lamberton,** Research Supervisor, **General Cable Corp.,** Bayonne, N. J.; "The Trend Toward Vinyl Insulation in Automotive Wiring Systems" by **R. H. Publow, Chief Chemist, Essex Wire Corp.,** Detroit, Mich.; "Maintenance and Repair of Signal Corps Wire Equipment" by **John A. Fitch,** Chief, Industrial Equipment Div., **Signal Corps Supply Agency,** Department of the Army, Philadelphia, Pa., and "Reel Drive Selection" by **R. K. Larson,** Systems Engineering Section, **General Electric Co.,** Schenectady, N. Y.

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A sound-color motion picture, entitled, "In The Chips", shown through the courtesy of the **Chase Brass and Copper Company,** Waterbury, Conn., concluded the session. The picture portrayed the fabrication of brass fasteners and other products on machine tool lathes.

Wednesday, November 16th

9:00 A.M. — With **Andrew Pudlak,** Field Engineer, **Copperweld Steel Corp.,** Glassport, Pa., in the chair, this final technical session heard four papers and a film. Papers presented were: "Tin-Zinc Alloy Plating—Its Application to Copper Wire" by **Dr. Frederick A. Lowenheim,** Supervisor, Electrochemical Research and **R. T. Gore,** Technical Service Engineer, **Metal and Thermit Corp.,** Rahway, N. J.; "Basic Principles of Continuous Wire Plating" by **A. B. Ashton,** Research Manager, **Frederick Smith & Co., Ltd.,** Manchester, Eng.; "Wire Die Shape and Finish; Some Recent Developments in Production and Inspection" by **E. J. Schneider,** Vice Pres., **Engis Equipment Co.,** Chicago, Ill.; and "Chrome Carbides for Hot Extrusion of Brass and Copper" by **A. Earle Glen,** Manager, Die Sales, **Carboloy Dept., General Electric Co.,** Detroit, Mich.

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The motion picture, in sound and color, was shown through the courtesy of the **Anaconda Copper Mining Co.,** New York, N. Y., and was titled, "Nerves of the Nation." This picture was an extraordinarily fine one, showing the manufacture of rods, wire and electric wire and cable.

The Annual Luncheon

Approximately 350 persons attended this colorful and pleasing annual event, many ladies being

The 1955 Annual Luncheon of The Wire Association. Can you find yourself in the crowd?

present.

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After the tables were cleared, President Whitney extended a cordial welcome to the members and guests present. After introducing those at the speakers' table, he called upon **Allan B. Dove,** Chairman of the Medal Award Committee, to explain how papers were selected under the Oxford System, and to present the awards. To **Norman A. Wilson,** Assistant Director of Research, Morgan Construction Company in Worcester, Mass., for his paper, "The Cooling of Steel Wire During Continuous Drawing," he then presented the Medal Award, a Gorham bronze plaque given each year to the man whose paper in the preceding year was considered the most meritorious contribution to the advancement of wire fabrication.

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A Certificate of Honorable Mention was then awarded to **Donald K. White,** Foreman of the No. 2 Wire Mill of **John A. Roebling's Sons Corp.,** Roebling, N. J., for his paper, "Continuous Patenting, Cleaning and Coating," which the Committee had considered the second-best paper given in 1954.

Allan B. Dove, Chairman, Medal Award Committee, presenting the Gorham bronze medal to Norman A. Wilson for the most meritorious paper presented in 1954, entitled "The Cooling of Steel Wire During Continuous Wire Drawing." * * * * * * * * *

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Leonard C. Crewe, Jr., Chairman of the Board of Past Presidents, was called upon to present Twenty-Five Year Membership Certificates to those who, in 1955, had been members of the Association continuously for the last quarter-century. Those receiving certificates were:

COL. GEORGE P. BUSH, U.S.A. (Ret.) Bethesda, Md.

HUGH B. CARNAHAN, Asst. General Works Mgr.
Canada Wire & Cable Co., Ltd., Toronto, Canada

HERBERT B. CLARK, Executive Vice Pres.
Fansteel Metallurgical Corp., No. Chicago, Ill.

Left to Right at Head Table: Richard E. Brown, Executive Secretary, The Wire Association; R. S. Bleckly, Director and General Manager, Rylands Brothers Limited, Warrington, England; B. J. Sirois, Metallurgist, Phelps Dodge Copper Products Corp.; Stewart S. Gray, Asst. Vice President, Union Wire Rope Corp.; John A. Moritz, Jr., President, Standard Industrial Compounds Co.; Ralph B. Roth, Vice President, Ludlow Saylor Wire Cloth Co.; John H. Corson, Manager of the Laboratory, The Carpenter Steel Co.; Leslie C. Whitney, Manager, Development Engineering, Copperweld Steel Co.; Norman A. Wilson, Asst. Director of Research, Morgan Construction Co.; Clem L. McGowan, Superintendent, Wire Mill, Atlantic Steel Co.; Allan B. Dove, Research Supervisor, Steel Company of Canada Ltd.; Ralph K. Clifford, President, Continental Steel Corp.; Fred M. Crapo, President, Indiana Steel and Wire Co.; LeRoy D. Seymour, Consulting Engineer; and Leonard C. Crewe, Jr., President, Maryland Fine and Specialty Wire Co. * * * *

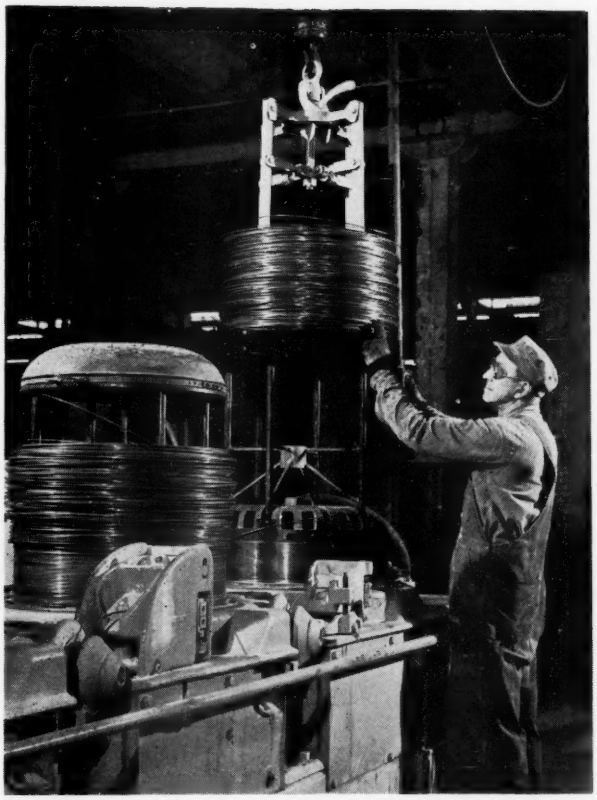

Figure 1—Tough carbon steel wire is drawn from rods at United States Steel's Waukegan wire mill. The rods are pulled through tungsten carbide dies to obtain wire of the desired size. Wire drawer is using an electric hoist to remove finished wire from his wire drawing machine. * * *

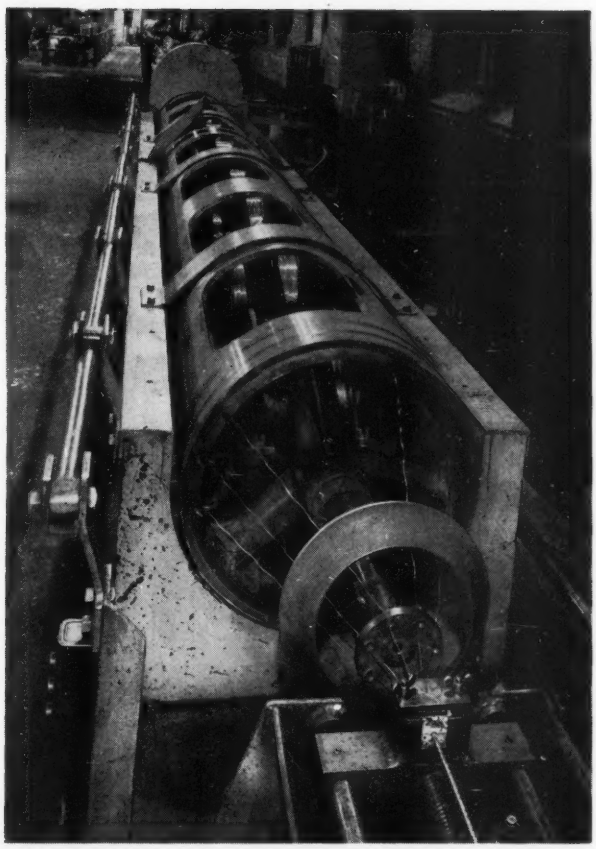

Figure 2—Long view of one of Waukegan Works' wire stranding machines, equipped with 7 reels of wire mounted at the center of the machine. Rotating, the machines pre-form the wire so that it can be uniformly twisted into guy wires, wire cable, and, with special conductor cores of either aluminum or copper, electrical transmission lines. * * * *

JOHN H. DeKLYN, Mgr., Massena Operations
Aluminum Company of America, Massena, N. Y.

EDWARD F. EARLY, Supt., Morgan Works
Wickwire Spencer Steel Division
Colorado Fuel & Iron Corp., Worcester, Mass.

FLINT C. ELDER, Consulting Metallurgical Eng.
Cleveland, Ohio

HENRY M. HEYN, Vice President
Surface Combustion Corp., Toledo, Ohio

CARL WALTER HOLMQUIST, Executive Vice Pres.
Copperweld Steel Corp., Warren, Ohio

JAMES K. MacDOUGALL, Manager
Rylands Bros. (Australia) Ltd.
Newcastle, Australia

ARTHUR G. MADISON, Sec'y.
Madison Wire Co., Buffalo, N. Y.

(*Please turn to page* 110)

Figure 3—Wire-drawing machines which produce fly screen wire at Waukegan Works. These machines draw the wire through 11 dies, the last four of which are diamonds. Fly screen wire is produced of copper, bronze, or galvanized steel. This plant can make more than 48 billion feet of fly screen wire each year. * * * * * * * *

Figure 4—Straightened and cut department, Waukegan Works. Here, machines uncoil drawn wire, pass it through a set of pinch rolls to straighten it, and cut it to lengths. This plant straightens and cuts wire from 10/1000" to ¾" in diameter and up to 30' long. Users of this product process the straightened and cut wire into roller bearings, welding rod and tiny florist wire—a few of its many uses. * * * * * *

Symposium on Production Scheduling and Inventory Control

Panel Members

John L. Sanderson
Superintendent, Wire Mills
Keystone Steel & Wire Co.
Peoria, Ill.

L. W. Hackley
Director of Production Planning
American Steel & Wire Div.
United States Steel Corp.
Cleveland, Ohio

Tom M. Girdler, Jr.
Assistant Division Mgr.
Republic Steel Corp.
Union Drawn Steel Div
Massillon, Ohio

C. M. Wilbur
Production Control Dept.
International Business Machines Corp.
Endicott, N. Y.

A. C. Morse
Chicago Manager
Remington-Rand, Inc.
Chicago, Ill.

A symposium held during the Annual Convention of The Wire Association in Chicago, November 14, 1955. At a time when the wire industry is operating at high levels of production, this symposium proved to be especially timely and assisted many to correct inefficient operating conditions and integrate production more closely with order commitments. It brought out points of vital interest to all wire men.

The following papers were presented by panel members and are published with the discussions that followed.

Scheduling and Inventory Control of Cold Drawn Orders

by

T. W. Harman
Manager of Order-Service

and

J. C. Farrell
Asst. Manager of Order-Service

Republic Steel Corporation
Union Drawn Steel Division
Massillon, Ohio

In view of the recent demand for steel, we are aware of the many problems of scheduling and inventory control. A discussion of these problems at this time will be beneficial to all of us.

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The following is an outline of our scheduling procedure:

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A customer's order is accepted for a given delivery to coincide as near as possible with the customer's requested delivery. The accepted delivery is based on the promise of raw material and the availability of production time and tonnage on each piece of equipment. This delivery is acknowledged to the customer so no misunderstanding is present. A machine time record for each machine is kept to show the amount of production time and tonnage available for each month. Accepted orders are plotted against this record, which provides a constant check of the amount of time and tonnage booked for each machine and also the amount of capacity still available. From this, the production load is determined. If this record shows that there is a lack of work for some machines, the Sales Department attempts to procure orders for this equipment. Hot rolled material for these orders is then requisitioned.

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When the raw material is received, it is applied on the cold drawn order and also posted on inventory records.

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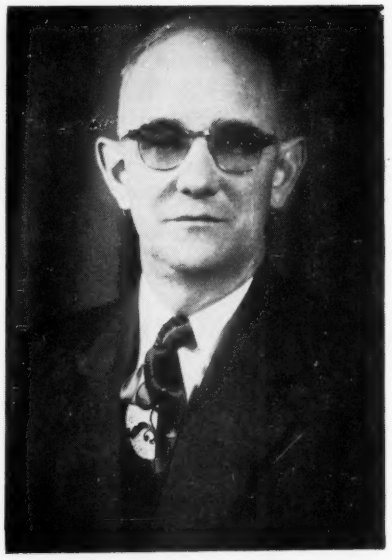
These orders are then sent to the Planning Department, where a record, by machine, on a weekly basis is kept by a schedule clerk. This is done to show the amount of raw material on hand for each major piece of producing equipment. The week the orders are scheduled for production is noted on the order and the shop orders



T. W. Harman

Mr. Harman joined Union Drawn in 1923 as a correspondence clerk in the Order and Service Department. He is familiar with all phases of this work having served as assistant manager for six years prior to his appointment as manager. He coordinates the activities of the operating and sales departments to see that customers get the steel they order on schedule.

Mr. Farrell has been with Union Drawn for fourteen years, except for three years in the U.S. Army Air Force. His career parallels that of Mr. Harman.

The paper, in the absence of the authors, was read by Tom M. Girdler, Jr.

J. C. Farrell

are prepared. The following copies of an order are made: a shipping card, a schedule card and time slips, a pink follow-up card, and a Rough Stock card. One copy is sent to the Order Correspondent in the Service Department to note a follow-up card of the scheduled production week. From this information, he determines the actual delivery promise to be given the customer. The balance of the copies are then filed in the Planning Department according to the scheduled week.

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On Thursday prior to the scheduled production week, the schedule and time slips are removed from the file and sent to the dispatcher in the Production Control Station in the mill. The dispatcher issues a work schedule for each operation. The time slip is removed and sent to the Rough Stock foreman to forward material to the Pickling Room. When this is done, the time slip is returned to the dispatcher who issues another time slip for the next operation. This pattern is followed for each succeeding operation until the material is processed. This procedure insures a knowledge of the exact location of each order on the mill and a constant flow of material for all equipment. Upon completion of the order, the amount of finished stock is noted on the schedule card, which is returned to the Planning Department. In the Planning Department the finished weight is noted on the shipping card which is forwarded to the Shipping Department for shipment of material. The schedule card is then forwarded to the inventory clerk for posting finished material to the inventory records. A copy of the order showing the finished weight is then sent to the Order Correspondent in the Service Department who notes the finished weight on the follow-up card.

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The Order Correspondents in the Service Department maintain a follow-up system on each order. There is a follow-up card for each order on which is noted all hot rolled promises and all cold finished delivery promises. These follow-up cards are filed according to delivery month in alphabetical order. The Order Correspondents expedite the hot rolled material and follow the raw material to insure its application to the proper orders. Prior to the receipt of hot rolled material, cold drawn promises are based according to the hot rolled promise plus the production time needed in the mill. If the hot rolled material is not received as scheduled, the delivery promise is altered to agree with the information received from the Planning Department. All delivery promises and order changes are handled between the Planning Department and Service Department. All delivery requests and order changes go to the Order Correspondents from District Sales Offices or customers, direct. These are answered by the Order Correspondent who is responsible for orders from a given group of District Sales offices.

I would now like to discuss our inventory control system. Inventory records are kept by using a visible card system. An inventory card is made for each size and grade upon receipt of raw material. After the material is produced, the raw material is taken off the inventory record and the card is filed. A card is then made entering the material in the finished inventory. When the material is shipped, it is taken off the finished inventory record and the card filed. Under this system, only the active inventory is on the records.

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We have three types of hot rolled inventory of which one type is steel to be used against a bona fide order. We carry two types of stock inventory: a general stock inventory and stock earmarked against an inventory authorization. The general stock inventory is an inventory of standard sizes and grades. The amount of this inventory is based on past performance and present trends. All inquiries and orders are checked against this inventory for possible application. This is a constant inventory and, as material is used, it is immediately replaced for future orders. By maintaining this stock inventory, shorter deliveries can be quoted. The stock earmarked against an inventory authorization is an inventory determined by require-

ments of a specific customer by size and grade of repetitive items based on the anticipated monthly usage. This inventory also is replaced as soon as stock has been consumed. Any change in a customer's requirements is immediately adjusted on the inventory authorization. This type of inventory requires very close attention and close relationship with the customer involved.

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From the foregoing, you can see that scheduling is first on a monthly basis, then weekly as raw material is received, and finally daily by follow-up during the actual production of orders. In this manner, we feel an accurate and flexible job of scheduling can be done.

Production Scheduling and Inventory Control

by John L. Sanderson
Superintendent of Wire Mills
Keystone Steel and Wire Company
Peoria, Illinois

This paper was a part of the Symposium on Production Scheduling Based on Inventory Control and was presented by Mr. Sanderson, a member of the panel, at the Annual Convention of The Wire Association in Chicago on November 14, 1955.

With the wire industry running at peak capacity the subject we are about to embark upon is, I believe, of utmost importance. We of the panel sincerely hope that all in the room will participate in the program, and we welcome all ideas and suggestions. My part in the program is to relay to you how we schedule and run inventory control. Of course, from an operating standpoint, we feel we have a great deal of good points as well as bad ones which we are trying to overcome. As briefly as possible I would like to give a general summarization of how we handle our inventory control.

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With the assistance of outside help, a complete survey was made on all paper work handled by the office; that is, all incoming orders, method and procedure of processing them, and setting up the inventory control. Several years' records of each individual item in Merchant Trade were recapped, and, from that point a minimum and maximum inventory was set which gave us a guide for the sales, production and operating departments to follow.

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Our experience in the past two years has proven that, when business is on a decline, a definite goal can be set for meeting maximum inventories. I cannot over-emphasize, in the handling of Merchant Trade orders, the many, many items that were studied and set up. This was handled at a central control or inventory station which is available to everyone concerned involved in the handling of these materials. These records are kept up-to-date with the amount of unfilled orders by either rolls of fence or cartons of nails posted. This shows the amount of unfilled items, the amount available, as well as the shipments made. This system works very well until an unusual run or shipments are made and, various stocks being depleted, naturally throws things in a turmoil.

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With our Management being willing to build stocks and tie up a great deal of money in inventories in the anticipation of demands made upon us, a very good job has been done and has paid dividends. The greatest weakness I can see in the program, and bear in mind that I am speaking of Merchant Trade items, is when the demand exceeds production and inventories are depleted—then we are in trouble. I am sure all of you that are handling these items certainly agree.

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In my humble opinion that is the point where I feel representatives of Remington Rand or IBM companies might have something to say in furthering the ideas of this symposium. The only solution that would seem possible to do would be then to spearhead the operation from the orders that are in the hands of the Shipping Department. At that point the Shipping Department should have at least one week's orders available for them, and the scheduling be done from that point. I feel it is almost necessary to move the inventory control setup from its strategic point in the office to a location in the Shipping Department or in the hands of a dispatcher where all available information on the unfilled orders in the Shipping Department's hands would then be relayed to the Production Department head, then to the scheduling men in the various departments.

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All my discussion on the forementioned has been on Merchant Trade items. Again I refer to the other members on this panel who are not in the wire business, Messrs. Wilbur and Morse. On this point I believe they may have something by which it might be possible to run a recap by means of tabulation which in a short while can let the Production Department know what unfilled orders are outstanding.

Story of a contractor who lost his shirt

(or why use ELGIN Diamond)

Once upon a time there was a contractor. He was a good contractor. He worked hard, knew his business, did all the things that help pile up the bucks. This contractor built houses, hotels, highways, anything . . . and that meant concrete. Why, he used so much concrete it just wasn't funny.

One day, a salesman from a new kind of company called on our contractor and tried to sell him "ready-mixed" concrete.. "Ready-mixed" concrete . . . now wasn't that a silly thing? Why, he'd been mixing his own concrete for nigh onto 20 years. Why change now? "Ready-mixed" . . . ridiculous.

Well, as it happened, the same salesman called on some of Mr. Contractor's competitors and they thought "ready-mixed" concrete was great, tremendous, terrific. They found there was no waste, it was convenient and even saved them money. It wasn't long before friend contractor lost his shirt. Sad? Yes . . . if only he had *tried* "ready-mixed".

Today, there's a "ready-mixed" type of diamond abrasive on the market called Elgin Diamond. Lots of companies use it—some don't. Those that do have found that with Elgin Diamond there's no bothersome mixing or special grading, no costly waste or chance for error. They also found that because diamond particles are permanently suspended in a specially formulated, color-identified vehicle, they get consistent polishing results.

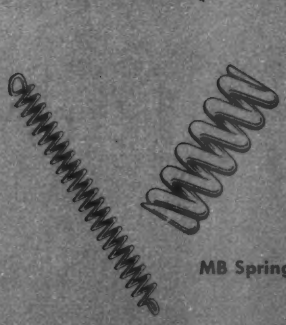
We're not saying you'll lose your shirt if you don't use Elgin Diamond. We are saying you owe it to yourself and your company to try Elgin Diamond. You can get all the facts by writing.

ABRASIVES DIVISION

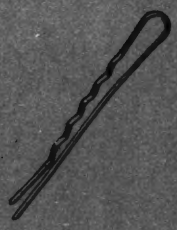
Dept. G

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS



MB Spring Wire



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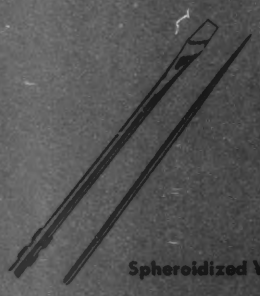
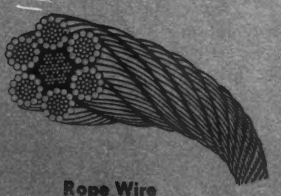


Spheroidized Wire

Gamma Spring Wire

Picture Cord Wire

Stapling Wire



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Fuse Wire
Glass Netting Wire
Hairpin Wire
Hook and Eye Wire
Hose Reinforcement Wire
Mattress Wire
Picker Tooth Wire
Pin Ticket Wire
Pin Wire
Spiral Binding Wire
Stone Wire
Weaving Wire
Wissco Iron Wire

manufacturers' wire

Armor Wire
Box Binding Wire
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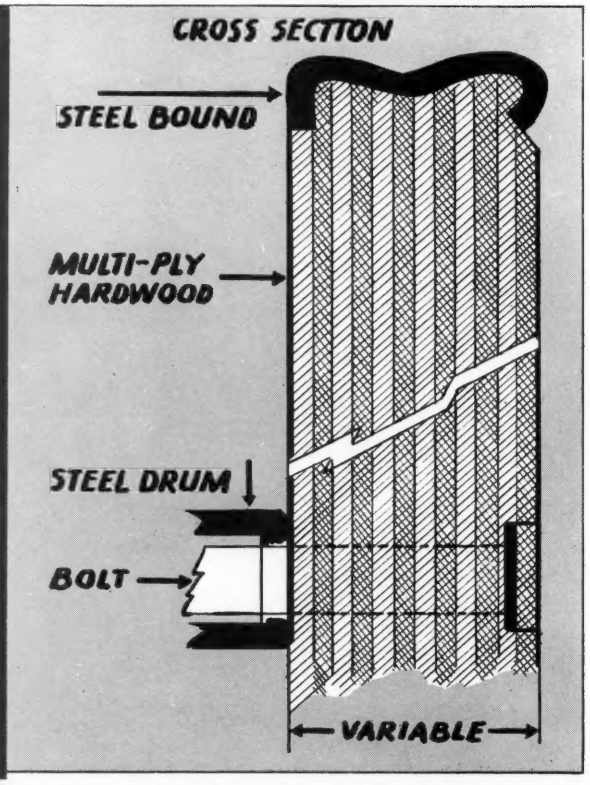

LOWER INITIAL COST

FOR DETAILS CONTACT

HUBBARD SPOOL CO.

GARRETT, INDIANA

Now getting into the Industrial Trade items involving smooth wire. This is somewhat more complicated since nearly all smooth wire is tailormade. Requirements by customers, even though they may use the same kind of wire, varies from time to time. Production scheduling in this division is difficult, particularly when you are processing wire to the extent of 20% of your available production. However, taking an optimistic view on this problem, it would be lovely if all material were straight drawn, sent to the Bundling Department, bundled, and then shipped to the customer. However, the customer is boss and we must comply with his demands and make the production as best we know how in accordance with the procedure set up by metallurgical departments.

★ ★ ★

On the handling of smooth wire all orders received by the Sales Department receive a tentative date for shipment. These orders are then sent to the Production Department who either confirms the date or sets a date on which the expected items can be shipped. This information is then relayed back to the Sales Department so they can confirm those dates with the customers. From the customers' invoices are set forth loading records and other copies which, in turn, are set up on what we call mill orders. These mill orders are the blueprints on all smooth wire to be made in our departments. This entails the kind of steel, size of rod, various practices even to the point of information in the bundling and shipping instructions. All departments that have anything to do with the handling of this material in the slightest way receive copies of these mill orders.

★ ★ ★

In the system we now use, the first or second number denotes the month in which the mill order is to be shipped. For example, I will give you Mill Order 11111. The first two numbers in this case denotes to the mill that it is the 11th month, which is November. The 111 is purely a designation whereas we can talk and say Mill Order 11,111 and instantly the mill or people involved in handling this order can refer to it instead of saying such and such a size wire for such and such a company. If we were to refer to the latter, too much time would be spent in trying to find out what we were talking about. If the last three numbers run over 999 we will then start over with 001 with a suffix 'A' and then go on through until another 999 orders are written.

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Again I refer to fellow members on this panel and ask if they have such equipment that would tell us in a very short while the status of all unfilled orders in a very quick and concise manner.

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I feel, gentlemen, that I have only touched briefly on the possible scheduling of a mill and I have just tried to inject a few ideas. I sincerely hope that mentioning what I have will bring out some questions which I will try to answer to the satisfaction of all concerned. I know that all of you have problems in scheduling, and our greatest complaint is that, particularly with a full mill, someone is over-scheduling. The Sales Department comes back and says the mill is only trying to run at 75 or 80% capacity. We then start trying to find out what the trouble is, and before we come up with the solution we find ourselves chasing bottlenecks.

Multiple Plant Schedule and Inventory Control

by L. W. Hackley
Director—Production Planning
American Steel and Wire Division
United States Steel Corporation
Cleveland, Ohio

This paper, a part of the Symposium on Production Scheduling Based on Inventory Control, was presented at the Annual Convention of The Wire Association in Chicago, Ill., on November 14. 1955.

The average problem of schedule and inventory control is predominantly an individual department or plant situation. There is, however, a wide area in which each company having a number of plants has had to evolve its own individual management technique to meet the problems.

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The American Steel & Wire Division of United States Steel Corporation has, we believe, a modern approach to the problems of production scheduling and inventory control involving many products, several plants, and hundreds of miles of geography. The management technique in this area involves the "Big Four" of administration, organization, coordination, and cooperation.

★ ★ ★

The American plan has now been in effect for several years, through periods of both buyers' and sellers' markets. It has withstood the test of Government controlled produc-

tion during the latter stages of World War II and more recently the Korean situation of 1951 and 1952. It has proven adequate to meet the sellers' market existing from 1945 through 1948, the post recession period of 1950 through June, 1953, and more recently the surging markets of 1955.

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Over these years growing pains were experienced and rapid changes in markets were taking place, requiring maximum flexibility in adapting the system to meet these conditions. This experience has only strengthened our opinion that the plan used is the best yet devised for our particular situation because it has been the product of many people's thinking and has proven workable under the varied conditions of competitive free enterprise.

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Production scheduling and inventory control are but two of the functions vested in the Production Planning Department. The Department is a staff function under the direct supervision of the Line Operating Department at all levels of management. To understand the problems and the approach to their solution means first understanding the organization charged with the responsibility. A simplified chart showing the various levels of management would appear as shown in Fig. 1.

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Briefly, the line organization extends from the Vice President of Operations to the District Managers of Operations, whose jurisdiction involves the supervision of all manufacturing plants scattered geographically from Worcester, Massachusetts, in the east, to Duluth, Minnesota, in the west, with production facilities concentrated also in the Pittsburgh, Cleveland, and the Chicago areas. The line management control is from the District Managers to the General or Works Superintendents of the plants; each Manager of Operations having one or more of the plants under his direct

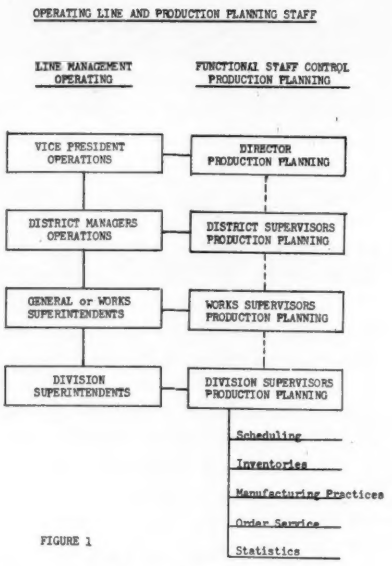

FIGURE 1

line supervision.

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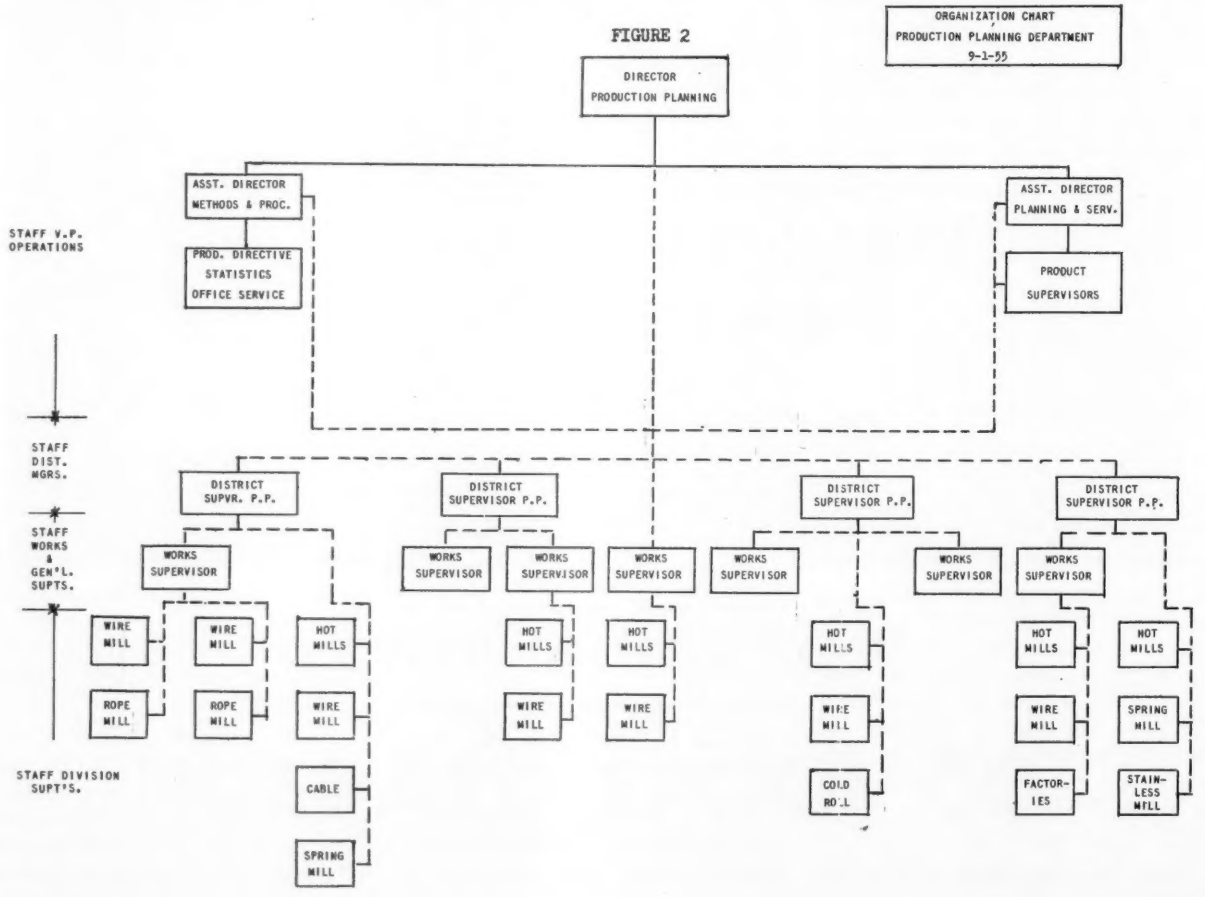
At the Headquarters of the Division, reporting to the Vice President of Operations, is the Director of Production Planning, whose responsibility is predominantly that of administration and coordination

FIGURE 2



in the fields of:

(1) **Manufacturing and commercial problems dealing with current and future production and sales,**
(2) **Inventories within the Division,**
(3) **Development of the detailed production, shipping and inventory plans, which will assist executive decisions and permit dollarization for profit planning purposes.**

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Each District Manager of Operations has a District Supervisor of Production Planning, whose responsibility is the coordination of sales, production and inventory control within the plants of the District.

★ ★ ★

At the plant level, each Works has a Works Planning Supervisor or one or more Division Supervisors of Production Planning, reporting to a General, Works, or Division Superintendent of Operations. It is at the level of the Division Supervisor of Production Planning that the orders are received directly from the Sales offices and translated into the specific monthly, weekly and daily production schedules. At this level exist also the basic records for the detailed job of inventory control on an item by item basis. A chart showing the complete organization of Production Planning and the direct Line Management to whom we report would appear as shown in Fig. 2.

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With this brief explanation of the organization of the Production Planning activity, let us move into the area of establishing coordinated sales and production plans. Production Planning in the multiple plant company begins with the Sales Forecasts. These forecasts must originate at the Sales offices where the personnel is closest to the market. The salesman must be sufficiently close to the customer to know whether his operations are going up, down, or laterally and whether his material requirements in the future months reflect planned increases or decreases in the inventories of materials which we sell.

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Once a month each Sales office prepares a forecast covering each of the next three months, in which is indicated the volume of sales which that office management feels it can put on the line for manufacture and shipment from any of the plants which logically service that Sales territory. These forecasts are in terms of many different classifications of steel products and must be separately prepared for each of the three months in terms of the manufacturing districts from which the products will be produced and shipped. Their guides in this area are lists of products manufactured in the various plants and economic area maps which define about each plant the area within which it can ship before its delivered cost to the customer overlaps that of an adjacent plant within the Division.

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The forecasts prepared in this manner are released simultaneously to the District Supervisors, Production Planning, and to the Headquarters of the Division each month covering the three succeeding months. At Headquarters by tabulation technique, the individual Sales offices' forecasts are consolidated to reflect the forecast as well as order bookings in each of the manufacturing districts and the division in total.

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At this point let us look at a chart showing this field of Sales and Production coordination (See Fig. 3 below).

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Here we see the basic Line Sales Organization, with control from the Vice President of Sales to the Area Managers of Sales and thence to the individual Sales offices.

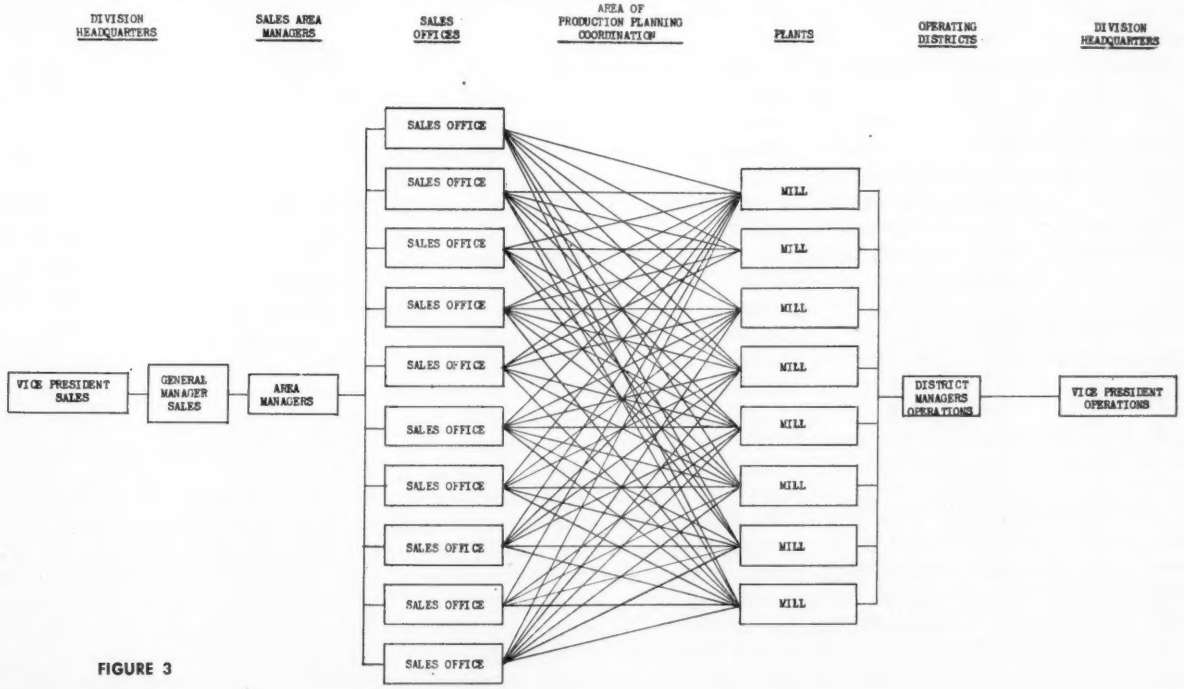

FIGURE 3

These offices, with their salesmen closest to the customer and his rate of activity have given us a picture of his current and future requirements, which, at the District level, provides the plants with trend information. It also provides headquarters with a quick look at the over-all direction in which the Sales Department feels that our markets are going in the next three-month period. The evolvement of the Sales and Production plans are then subjected to a very close scrutiny at the District Production Planning level, where, with the assistance of the Works and Division Supervisors of Production Planning, the sales forecasts for the plants in that district are reviewed with respect to the ability of those plants to manufacture the tonnages of each product as forecasted. Where the forecast of Sales for any product is in excess of current manufacturing capacity, the forecast is reduced to the manufacturing capacity level and the Sales offices and the Area Managers of Sales responsible for the forecasted volume within the manufacturing district is informed of the deficiency in manufacturing capacity.

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Where the plant capacity is in excess of the forecast, this information, too, is broadcast throughout the Sales organization so that additional Sales effort may be concentrated in that area. This review of the forecast with respect to ability to manufacture in each of the next three months takes place within a 24-hour period and the results of these deliberations are telephoned to the Headquarters Production Planning organization. At this level, from the plant summaries of sales forecasts and proposed production and shipments, a recapitulation is made for the entire Division representing all of the plants. Concurrently with this work, from the Headquarters summaries received from the tabulating bureau, the amount of steel required to execute the sales forecast at each location has been determined and, when reviewed with respect to the inventories at each plant, decisions are made as to the basic steel production which is to be authorized at each location. In addition, the schedule of steel purchases is determined, so that our sister divisions of United States Steel Corporation, which supply these requirements, are made aware of the situation.

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If, in this determination of future open hearth levels and the schedules of steel purchases for the next three month period, it is desirable to either expand or shrink inventories of semi-finished steel at any of the plant locations, these decisions are made and incorporated into the planning.

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At this stage in the production scheduling program, the interested parties are brought together in what we have termed a Production Directive Committee at the headquarters of the Division. This committee consists of representation from all Departments of the Division as follows:

(1) Vice President of Operations
(2) Chief Industrial Engineer
(3) Chief Metallurgical Engineer
(4) Chief Engineer
(5) Vice President of Sales
(6) Product Sales Managers
(7) Comptroller
(8) Supervisor, Financial Statistics
(9) Supervisor, Sales Statistics
(10) Manager, Commercial Research
(11) Staff Assistant—President's Office

★ ★ ★

The purpose of the Production Directive Committee review is to take a look at the jelling sales and production plans and to point up those areas in which greater Sales or Operating attention is needed, and those areas in which the Staff can best spend their time in the next three months aiding in the execution of the production and shipping plans. Such Staff assistance deals with problems of new facility installations, new or revised incentive rates, quality control, etc. At this same meeting, the Financial representatives are in a position to receive the benefit of the current planning of sales and production as it may affect the financial planning of the business.

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At this meeting each and every product is reviewed from the standpoint of the level of forecast of sales and the planned production against the forecast. The Operating organization must concur in the forecast of sales from the standpoint of ability to produce at the individual plants. It is only in those areas of products which are forecasted at above capacity levels that the Operating organization injects its position from the standpoint of production scheduling. Out of this meeting must come an approved set of production and shipping plans in which the Sales management of the company has concurred, for it is against these approved plans that the Production Planning Department then begins its detailed control of production by authorizing back to the plants their proportionate share in the over-all totals. As a result of the Headquarters Meeting, additional production may be authorized, for inventory purposes, or reductions in operations due to seasonal markets or other causes are translated into final plans for the following month and tentative plans for the future as indicated by the trend.

★ ★ ★

All of this activity has been completed prior to the beginning of each month. You will thus note that with respect to the third month hence in each of the monthly forecasts, we are in effect getting the benefit of three distinctive appraisals of each month on the part of the District Sales Offices. It is this feature of repeated review under close supervision that has enabled us to drive accuracy into the Sales Forecast Procedure for the short term three-month period. This accuracy is of paramount importance in the over-all planning.

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We call your attention specifically to the fact that the broad production plans for the plants have assured the flow of materials from the starting operations, namely the open hearths or the purchases, through the various operations, so that in terms of finished products, the forecasted amounts can be produced. If then, the orders as received daily at the plants develop in the amounts as forecasted by the Sales Department, the material

with which to make them has been assured and the balance of operations in each plant has been established. This solves one of the sorest problems that can develop in a sellers' market, namely, more orders than the amount of material which can be guaranteed from which to manufacture them. In addition, emphasis is placed on carrying inventories of semi-finished steels at those levels at each plant which will assure availability of steel of different specifications to meet the probable product mix requirements of the current sales forecast.

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From the backlog of incoming orders against weekly load charts, the Division Planning Departments at each Works evolve the weekly schedules of operations department by department, machine by machine, and the number of turns of operation are arrived at for the posting of schedules in the various departments. From these same load charts weekly schedules of individual orders to be processed in the mills are issued. At all times, as the incoming orders are received, the items requiring manufacture are posted to the various facility load charts, after determining the availability of starting material. Promises of shipment are thus determined and forwarded to the Sales Department on a copy of each order. Stock replacement orders are also posted to the load charts and the resulting promises given to the Inventory Clerks, who in turn determine the promises of shipment on the customers' orders.

★ ★ ★

Let us now revert back to the Headquarters Production Directive Meeting, at which we have arrived at a set of coordinated production and shipment plans on a plant by plant basis. Immediately after the Headquarters Production Directive Meeting, the Supervisor of Financial Statistics, as well as the Chief Accountants at each plant, is notified of the approved shipping, purchase and inventory plans for the current and future months. It is then possible for the Finance Department to determine before the month begins the amount of net profit, before taxes, expected to be generated. It is not our intent here to cover the financial implications of having continuously available that kind of information at the executive echelons of the business.

★ ★ ★

Now let us take a look at the matter of performance control against these plans; first, in terms of tonnage and second, in terms of profits. Each plant, from its scheduled working days in the month, is able to determine at any time the amount of product that should have been produced and shipped month to date. The Accounting organizations at each plant are invoicing daily as the shipments go forward and tabulation techniques compile currently the month to date shipments, as well as the month to date profits. It is obvious that this performance data on a daily basis enables the line management to determine quickly those areas in which their executive capabilities are best applied for the improvement of current performance.

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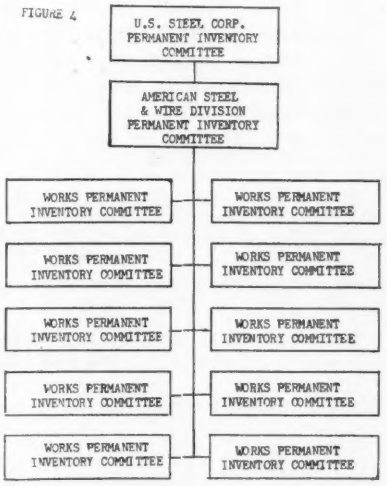
We feel this technique of performance control with respect to profits, inventories, production and sales is essentially sound. It is predicated upon source information obtained from the customers on a timely basis, that has been reviewed several times at all echelons of sales management. The production plans which have been derived from the forecasts have been evolved at the plant level and reviewed at the District and Headquarters levels by the Operating line and Production Planning organizations. There has been a reconciliation of sales requirements versus production capabilities through the means of the Headquarters Production Directive Meeting. The Finance Department has been kept informed at all times of the developing production and shipping plans. Current performance checks enable the management at all levels to remain flexible, so that changes in current production plans can be made where shortages of orders exist; production can be expanded where additional bookings develop beyond the forecast; and proper credit can be given at the various levels for a good job done, since there is a current means of measuring tonnage and profit performance.

★ ★ ★

We have purposely treated lightly in our preceding remarks the inventory control problem, in order that we might present it separately in its many ramifications. The organization structure used in controlling inventories is a committee approach because of the multiplicity of personnel involved in its use and control. All departments involved, such as Operating, Sales, Purchasing, Accounting, and Traffic, are represented on this committee, which in chart form would appear as follows:

FIGURE 4


U.S. STEEL CORP. PERMANENT INVENTORY COMMITTEE
AMERICAN STEEL & WIRE DIVISION PERMANENT INVENTORY COMMITTEE
WORKS PERMANENT INVENTORY COMMITTEE
WORKS PERMANENT INVENTORY COMMITTEE
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WORKS PERMANENT INVENTORY COMMITTEE

At the top level of the United States Steel Corporation, reporting to the Executive Committee, is the Permanent Inventory Committee with representation from each of the Divisions. Its responsibilities are simply stated:

(1) Over-all control of total investment in inventory.

(2) Selective control by broad inventory groups for attaining predetermined year-end positions for tax purposes.

(3) Coordination of over-all inventory planning on a Corporation basis as it affects current and projected working capital position in relation to monthly and quarterly forecasts of sales.

(4) Integration of material movements in terms of the Corporation's steamship and railroad activities.

★ ★ ★

Within the broad policy confines

as laid down by the Corporation Permanent Inventory Committee, each Division through its parallel committee controls its plant distribution of the various inventories. The Division Committee brings to bear on the problem any refinement of product breakdown within the broad inventory groupings dealt with at the Corporation level. The Division Committee acts at all times in an advisory capacity to the Executive Committee of the Division. Its actions are within the broad policy limitations of the Corporation Permanent Inventory Committee.

★ ★ ★

From the Division Headquarters there flows outward to the plants a control of inventory; raw materials, semi-finished steel, and finished steel products; each of which bears specific relationship to the current and projected inventory plans.

★ ★ ★

The control is picked up at the plant level in terms of policy and tonnage limits by product groups as defined by the Division Permanent Inventory Committee. However, at the Works or Plant level you cannot put into production or purchase a product group. The problem has now narrowed down to the specific wire sizes, steel specifications, etc. At the Works level, the agency to deal with this problem in its finite relationship to Sales service, schedules, economic order quantities, inventory limits, etc., is the Production Planning Department. They must work in close liaison with the Sales Department to determine the probable magnitudes of the approaching seasonal markets for each product, and to do so far enough in advance to enable maximum inventories to be reached prior to the beginning of the season. This is done by Headquarters consultation with the Plant Planning organizations who provide the basic information on the product mix detail of the items to be stocked. The mix detail is subject to review and approval by the Sales Department before the stock orders are issued by the Headquarters Production Planning organization to the individual mills. A stock order when issued to the mill has the same importance in the mill's production schedules as a customer's order, because it is an essential adjunct to the servicing of the Sales Department not only currently but also when the seasonal peak is reached. The authorized stock orders for finished products can at any time be used by the Plant Production Planning organizations to make up deficiencies in current production schedules where a drop-off in business would create serious manpower or labor relations problems or where such action will facilitate low cost operations.

★ ★ ★

The general review of integrated scheduling and inventory control which we have presented as practiced in our multiple plant steel and wire business has not given all of the details or techniques used. We have merely covered the highlights of the system, which has been made possible by the individual and collective effort of the management team.

Stock Allocation Procedure

by C. M. Wilbur
Special Representative
Manufacturing Control Department
International Business Machines Corporation
Endicott, New York

Some stock allocation procedures are based upon a requirement that orders be pre-edited for stock availability before filling, plus the need for instant references to stock balances to answer telephone and telegraph inquiries.

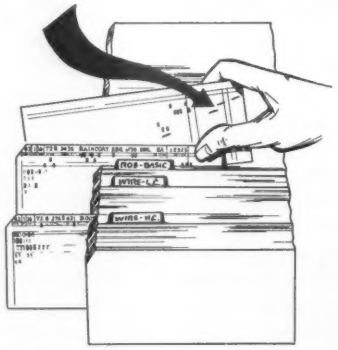
★ ★ ★

The following procedure meets these requirements:

★ ★ ★

The basic record is a visible IBM card inventory file. This card performs the function of visible reference to open balances, and the usual functions of an inventory balance card. A single card is punched for each stock item with the identification, description, price, stock balances, etc. These cards are filed in a felt-bottomed drawer about two inches wider than the length of the card and all cards are initially filed to the right of the drawer.

MARK SENSE and FILE



★ ★ ★

When an order is received, a master card is punched for it with the usual reference data plus the total of the number of items on the order. By means of the collator and reproducer, or a count-controlled gang punching reproducer, an individual card for each item is prepared and is gang

Mr. Wilbur joined IBM in 1929 as a member of the Accounting Department at Endicott and was promoted in 1936 to Manager of the IBM Department of the Endicott Plant. In 1941, he began a special Systems Service assignment at the Bethlehem Steel Corporation, returning to Endicott in June 1944 as an Instructor in the IBM School. In 1944, Mr. Wilbur was named a Special Representative in the Manufacturing Control Special Department, with headquarters in Endicott. In this capacity he participates in regularly scheduled Manufacturing Control Classes for IBM customers, which are held at the IBM School at Endicott. He and his colleagues also assist IBM local representatives in their development of Production Management applications. In this capacity they have visited more than 840 companies in approximately 325 cities.

This paper was presented as a part of the Symposium on Production Scheduling based on Inventory Control at the Annual Convention of The Wire Association in Chicago on November 14, 1955.

C. M. Wilbur

punched with the order number, etc., and the item (line) number.

★ ★ ★

These cards and the order go to a stock editor who has in front of him the punched inventory card file as described above. He selects item card number one, refers to the inventory punched card for that item number, determines action (fill, back order, etc.) and marks the card (mark sensing) with codes for action and quantity issued or back ordered. The item card is filed behind the inventory card and both are offset to the left. The felt bottom tends to hold these cards so that they cannot be accidently shifted to the right again.

★ ★ ★

In the same manner, coded cards for receipts, on orders, and other inventory transactions are inserted behind offset IBM inventory cards. Therefore, if more than one inquiry takes place per period, the revised balance may be readily calculated. It may be necessary, on a very few highly active items, to make manual calculations on the balance card as an interim measure.

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Twice a day (during the stock editor's lunch period and at the close of business) the offset cards are removed from the file (index signal cards being substituted) and sent to the machine accounting unit. Processing steps are:

1. Gang punch reference data from IBM inventory cards into detail cards and mark-sense punch item data.
2. Summarize to obtain new inventory balance cards, prove, interpret and refile.
3. Select detail cards and sort to item and order number.
4. Extend prices.
5. Prepare shipping documents.

Advantages of Method

1. Provides instantaneous reference to latest balances for pre-editing orders and handling inquiries.
2. Speeds up summary punching of new inventory balance cards since large files of balance cards need not be inefficiently collated against a relatively smaller volume of detail cards.
3. Reduces card volume in the inventory balance file to a single summary card for each item, as opposed to the relatively high volume of cards usually needed in tub file procedures.

The Tools of Production Control

by A. C. Morse, Chicago Manager
Remington Rand, Inc.
Chicago, Illinois

Transcript of a talk given by the author as a part of the Symposium on Production Planning Based on Inventory Control at the Annual Convention of The Wire Association in Chicago, Ill., on November 14, 1955.

Gentlemen, I think that it is the responsibility of all of the men in this room to either get orders, fill orders or do a combination of the two. Many feel that this is a complex problem. We do not believe that it is. We believe that there is no business operating problem that cannot be solved and that it is only a question of what it costs to get the information that you need and how you will make use of it.

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We believe that the factory is just like the kitchen. All of you have recipe books in your homes and this book not only helps to tell you what to have for dinner but is a step-by-step program of how to prepare that food. This is something you also have in your factories and which you may call by fancy names, such as bills of materials, process sheets; and then you have process engineers, motion and time study people and so on. However, the objectives are about the same.

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All of you know what happens when you call your wife at four-thirty in the afternoon and tell her that you are bringing home a friend for a roast beef dinner. You know that really is creating quite

a problem on the part of the good woman and it is almost a physical impossibility to do.

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Now, the sales department tries to tell that to the manufacturing department; and those of the manufacturing department here know that those crazy people in the sales department never sell what is in stock. I have been with my company for over twenty-five years and so I know all of the answers.

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You have to recognize that you never are going to overcome that problem 100% as long as you are going to make money. You do the best job that you can of predicting and of planning for that prediction. However, you cannot cook an apple pie and a roast beef in one oven at the same time assuming the required temperatures vary. I believe the problem is no different when you get into the factory.

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If we want to confine our comments to the management of inventory, what kind of inventory would you like to talk about — inventory of plant repair and maintenance? You cannot run your shop if you do not have a preventive maintenance program, and if you have not seen the G. E. film on preventive maintenance, then you should. If you do not schedule preventive maintenance and if you do not maintain adequate control of maintenance repair and operation supplies, then you will not have production as planned.

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Your factory inventory must be placed under control if you want production as planned.

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Obviously there are other inventories. There is raw material and—semi-finished parts inventory control and finished parts. These all are interrelated and you cannot avoid talking about one if you want to talk about the other. However, gentlemen, all production problems can be solved provided that you watch your costs and make sure that the information that you are producing is information that you need.

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I could have brought with me samples of some of the material that my predecessor mentioned which illustrates the kind of inventory forms and controls maintained even by organizations in your business. However, there is only one thing wrong with that. I have had a lot of experience in showing it to people and they say, "Well, that is fine but then that does not satisfy my requirements." They say their business is different. Of course everyone's business is different, just as each of us is different from the other. I think that the only time we do the same thing is when we work for Uncle Sam and he makes us do it his way. I have seen plants owned by my own company turning out identical products; but the information on which the decisions are made is not identical nor is it produced identically. The people representing or responsible for making the decisions are not the same.

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A previous speaker described his company's production planning department, and without a department such as that or without any function of production planning being recognized there is no planned production regardless of whether it is a department or individual. We believe that the **P**roduction **P**lanning **D**epartment should stand between sales and manufacturing. It is not only a planning department but also a buffer department. Production planning tells manufacturing what to make, how much to make, when to start, when to finish and it even can tell them the sequence of operation. It tells the shipping department the scheduled shipping date and it listens to the engineering department for material changes and it listens to the maintenance department for the time that they need to maintain the machinery, which is time that cannot be used for production. It tells the personnel department how many people are needed and at what salaries and skills. Finally, the production planning department may alter its decisions based on agreements between the vice president in charge of sales and the vice president in charge of manufacturing.

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The question as to whose promise is to be broken can be nicely settled by calling the vice president in charge of sales or the sales manager and saying, "Here is the material that we have, here are the orders for which it is mortgaged, and now you tell me which orders to take out."

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Now, all of the information that we have just reviewed, is the responsibility of the production planning department and it is something that can be accumulated in an orderly fashion. It could be accumulated on one set of papers or on one card. However, it has been found to be impractical, for there are too many different facets, too many different types of information.

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If you want to go back and talk about the raw materials, the semi-finished and finished parts inventory, there are only three ways in which you can operate — you can wet your finger and hold it up into the air and guess — you can use the crystal ball — you can work on a sales forecast and plan that way, or you can wait until you get the order into the house and cover your source with material purchases. If your competitor works on the sales forecast basis and you work on the latter basis, then who do you think is going to get the order? Therefore, this type of information usually is of value if your situation is competitive and if you are required to give your customer some estimate as to when things are going to go out.

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I could have brought to you a lot of forms to show you how things have been done but then I believe that my talking about our experiences would be more beneficial to you. If you people have inventory problems, of

course, we invite you to discuss them with us because I am sure that from all of our experience we will be able to be helpful to you.

* * *

I have a book here which describes our conception of what elements must be placed under control in the production planning department, but then there is no one standard and we therefore do not pretend to put one into the book. People and factories are not just like that. Thank you very much.

DISCUSSIONS ON SYMPOSIUM ON PRODUCTION SCHEDULING BASED ON INVENTORY CONTROL

MONDAY AFTERNOON

November 14, 1955

The Symposium on Production Scheduling Based on Inventory Control was convened at one-forty o'clock, P.M., with John A. Moritz, Jr., President, Standard Industrial Compounds Company, Chicago, Ill., presiding.

Mr. Moritz: We are here to discuss the production scheduling and inventory control problem.

First I would like to offer a brief personal analysis of these problems, which may or may not be correct as some of the other panel members see it, but then at least it is a starting point.

Just as the curing of a medical case depends on a correct diagnosis of a case, so the solution of this manufacturing problem requires a look into the events of the past few years to learn how this condition has developed.

About the date of 1940, the wire industry was producing at a moderate rate, looking for business, developing markets for wire and hoping for greater demand.

This was not a normal, gradual increase, it was a boom. Government orders were taking the greater part of production. Great changes of production specifications were required and this necessitated a switch from civilian and consumer products to armed service requirements. Mills were working on directives and wire was moved from a machine to trucks or trains in many cases. At that time our primary customer was Uncle Sam. This also resulted in increased production and as a result small mills became large ones.

With the war ending and industry returning to consumer products we found that consumer demand was great and it took all of our production. However, after the initial big push was over a lag came to our industry and then we began the process of gradual growth coupled with normal maintenance and replacement.

Of course, with this re-adjustment, warehouse and storage became a problem and this problem was solved by building warehouses for storage space.

This then brings us to today's situation — our customers are demanding prompt shipments to reduce heavy inventories.

Of course, this is a problem when we consider the fact that our mills are larger, the number of products have increased, competition has required greater attention to quality and accurate specifications. Further, these large mills have become bulky and are more difficult to function quickly. In a well-rounded mill, each item is different as to size, shape, specification and type of steel.

The problem of accurately keeping track of each item in storage and replacing it promptly from manufacturing facilities is the one which grows in proportion to the plant size, and the customer demands on deliveries.

This has been an analysis of today's subject and a brief look into the past, that enables us to see how these difficulties have evolved.

We have here representatives from three sizable wire mills who will give you their individual cases at this symposium and then we also have two representatives present from companies who manufacture tools to be used in setting up a system to solve these difficulties.

We are now ready for our first speaker. I would like to introduce **John L. Sanderson,** Superintendent, Wire Mills, Keystone Steel & Wire Company, Peoria, Ill.

[Mr. Sanderson then read his prepared paper entitled "Production Scheduling and Inventory Control."]

Mr. Moritz: Thank you, Mr. Sanderson.

* * *

Our next speaker will be **Tom M. Girdler, Jr.,** Asst. Division Manager, Union Drawn Steel Division, Republic Steel Corporation, Massillon, Ohio.

Mr. Girdler: Before I read this paper I would like to say that it was written by **Mr. T. W. Harman** and **Mr. J. C. Farrell** of our company. You know, being a supervisor I can delegate some of my responsibilities and so I wish to acknowledge **their** contribution here.

[Mr. Girdler then read the paper entitled "Scheduling and Inventory Control of Cold Drawn Orders."]

Mr. Moritz: Thank you, Mr. Girdler.

* * *

Our next paper will be given to us by **L. W. Hackley,** Director, Production Planning, American Steel and Wire Division, U. S. Steel Corporation, Cleveland, Ohio.

[Mr. Hackley then presented his prepared paper entitled: "Multiple Plant Schedule & Inventory Control."]

Mr. Moritz: Thank you, Mr. Hackley.

* * *

Now, we have had an explanation of the problem as it exists in our industry and of the manner in which our different plants are meeting the problem and how they are coping with it.

Our next two speakers are going to give you some ideas of the equipment and the tools which they are able to furnish to help expedite a great many of these problems.

I would first like to have you hear from **C. M. Wilbur,** Production Control Department, International Business Machines Corporation, Endicott, N. Y.

[Mr. Wilbur then presented a brief outline of a stock allocation procedure method developed by I. B. M.]

Mr. Moritz: Thank you, Mr. Wilbur.

* * *

Now we have another representative on the panel who will discuss the possible uses of tools and that is **A. C. Morse,** Chicago Manager, Remington-Rand, Inc., Chicago, Illinois.

[Mr. Morse then presented his talk.]

Mr. Moritz: Well, gentlemen, that about sums up the situation as far as our symposium is concerned. You have heard the talks by the panel and now we would like to have you ask some questions if you have any. Who has the first question?

Question: In connection with the discussion of Mr. Morse, I am wondering where you go — who finally makes the decision on the change? Say that you run into a production problem and cannot get out the order — who finally decides it?

Mr. Girdler: In our plant we leave it up to the superintendent of the mill. In other words, if the schedule is to be broken or something else is going to be run in ahead that is going to interfere with the normal flow then we place the responsibility for that on the superintendent of the mill.

Question: On what percentage of the theoretical capacity does the panel think that production might be safely scheduled?

Mr. Sanderson: 110 per cent. (Laughter.)

The down-to-earth guy should not exceed the figure of in excess of 92 per cent. Of course, I know that I and some of the other fellows here violate that.

Mr. Girdler: I think it all depends on what the sales forecaster shows with regard to the future. If it looks like it is going to be good for the next nine months then you might be able to hold it down below a hundred per cent. If it looks good for only two or three months than it might go up to 120 per cent, so that if we ran out of business you would have a little cushion.

Comment: I would like to say that we ask them to fill it up and we will take our chances.

Question: I am just wondering how we can establish what is a good inventory from the point of view of raw materials in process and finished goods.

Mr. Moritz: One of our authorities here says that it cannot be answered, but Mr. Hackley will attempt to answer it.

Mr. Hackley: As far as the raw materials inventory is concerned, that is as much as maybe you can afford. In the

(*Please turn to page* 108)

Wire Association Proceedings

Ferrous Section Discussions

TUESDAY, NOVEMBER 15, 1955

The Ferrous Division session convened at 9:40 o'clock, **Theodore B. Dull**, Superintendent, Wire Mill, Sheffield Steel Division, Armco Steel Corp., Kansas City, Mo. presiding.

Mr. Dull: Our first speaker this morning will be **Charles D. Gibbs,** Sales Manager, Industrial Gauges Corporation, Englewood, N. J., who will present to us his paper on "Continuous Gauging of Wire for Out of Roundness."

[Mr. Gibbs then presented his paper.] [Applause]

Mr. Dull: Thank you, Mr. Gibbs. Gentlemen, we are now ready for questions and answers.

DISCUSSION

Question: I notice that you have accuracy in this particular case of one mill. Is that, in that instance, dictated by the screen density of the photo-electric cell?

Mr. Gibbs: No, that is an over-all accuracy. The accuracy of the cell itself is far greater than one mill. The one mill accuracy is dictated by the distance we are mounted from the rod — the vibration of the rod, circuit limitations, rather than any inherent limitation of the photo cell itself.

Question: It has been my experience that cells are never of uniform density — that if you get a shadow thrown across it at one area that you cannot trigger them in accurately.

Mr. Gibbs: We are not measuring variations in density or in the amount of light hitting a cell. This cell is designed to be used strictly as an on and off item.

Question: Do you have any of these installations in operation now?

Mr. Gibbs: At the moment I cannot say that there are any. We have exported four of these and the exact picture of their operations is not available to us as yet. I believe that we have done a good job of getting the bugs out.

Question: Could you mention the price of that?

Mr. Gibbs: It is something under a thousand dollars. It is determined, to a large extent, by the manner of the installation.

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We will proceed with our next paper, which will be given by **Hugh Gehman,** Assistant Manager, American Chemical Paint Company, Ambler, Pennsylvania, and entitled "Advantages of Phosphating in Fastener Forming."

(The paper was then presented.) (Applause)

DISCUSSION

Question: How thick is that coating of phosphate?

Mr. Gehman: Generally the coating is of the order of .0002 inches thick around the stock.

Question: What is the approximate cost of putting this material on?

Mr. Gehman: That would depend on the size of the rod. On a half-inch rod it would be around sixty to sixty-five cents per ton. There is an additional cost with regard to the use of the lubricant.

Question: I was wondering whether there is any change between the time of dipping and the time of drawing.

Mr. Gehman: We have never observed it. I would say that the longest time lag there would be a week.

Question: Do you have a modification of this coating for stainless steel wire?

Mr. Gehman: We have not a modification but an entirely different type of process. We have not done any work in cold-heading stainless with this kind of coating.

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We now bring to you one of the good old gentlemen of the wire business, **Mr. N. Ransohoff,** Chairman of the Board, N. Ransohoff, Inc., Hamilton, Ohio, who will present his paper on "New Type Plating Barrel for Automatic Handling of Large Batches."

(Mr. Ransohoff presented the paper.) (Applause)

Mr. Dull: I am sure that you will all agree that this was an excellent presentation.

(The meeting adjourned at 11:15 o'clock, A.M.)

FERROUS DIVISION
TUESDAY AFTERNOON

November 15, 1955

The Ferrous Section convened at two o'clock, P.M., **Harry B. Matzen, Jr.,** Supt., Union Drawn Steel Division, Republic Steel Corporation, Hartford, Conn., presiding.

Mr. Matzen: I would now like to introduce our first speaker, **Dr. Alfred O. Koegel,** Manager, Westfalische Drahtindustrie, Hamm (Westf.,) Germany. His subject will be "Wire Descaling in Germany."

Dr. Koegel then read his prepared paper.) (Applause)

DISCUSSION

Question: This process has been applied to mostly low carbon steel rod?

Dr. Koegel: Yes.

Question: Have you tried it on high carbon rods?

Dr. Koegel: No, because we need to get rid of this sulphuric acid. Eighty per cent of our production is soft low carbon steel and only twenty per cent is high carbon. However, we are planning to erect a second installation for the making of high carbon steel.

Question: Is there any reason why this couldn't be put right through the shot blast oven?

Dr. Koegel: I think that we can do that and I thought of that in relation to our new furance and we have left some space there so that it could be put in later.

Question: I see by the shape that you have that the shot goes right through one layer and hits the other layer on the inside and that is what takes the scale off?

Dr. Koegel: Yes. I did not clear that up but that is right.

Question: I have a question that I would like to ask, but first I want to congratulate you on being far ahead of us over here in the states. We have a single strand machine in operation, but we have not succeeded in getting a multiple machine in operation, I would like to ask you if you could tell us a little bit more about the handling problems. I have reference to the coils.

Dr. Koegel: Of course, we are welding one coil to the other. However, everyone knows that on high carbon steel you will get some bends in it. What we have done here is to take a very old take-up frame and use it for this particular installation. We are now experimenting with something much newer.

Question: Have you in Germany done any work on vibration for the descaling of rod?

Dr. Koegel: I know of one test, but have never seen it. I have heard of it, but we would like to try it.

Question: You also said that the bending process of descaling did not work for you people because of the limited

speed, is that right?

Dr. Koegel: Yes.

Question: I think that one difficulty that does arise is the manufacturing of nails from that product. Have you been successful in making nails from the bending process?

Dr. Koegel: We have produced nails from wire descaled by means of bending. We think, however, that the highest speed that you can use is three meters per second and that means about six hundred feet per minute. With this speed you will succeed with descaling by means of bending, but not higher.

Question: In the rod rolling, do you make any attempt to control the amount of scale on the rod?

Dr. Koegel: We are about to do it, but we have not done it up until now.

Question: Have you noticed any particular effect of the shot blasting on the physical properties of the wire?

Dr. Koegel: It is going through so fast that we have not found on the surface any physical difference but, of course, from the drawing, the strength of the rod will be a little higher.

Question: Has any of this been used for making of bolts and nuts?

Dr. Koegel: No, only for low carbon steel. You see we have been running this equipment for only two months. We started at the beginning of September.

Mr. Matzen: Thank you, Dr. Koegel. We are indeed grateful that we had an opportunity of hearing what is going on in your country.

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Our next speaker will be **James L. Whitten** vice president of the Lee Wilson Engineering Co., Cleveland, Ohio. His paper is entitled: "High Convection Annealing for Wire Coils."

(Mr. Whitten read his paper) (Applause)

DISCUSSION

Question: What about the annealing cycle of about a fifteen thousand pound load?

Mr. Whitten: In this particular job we had 22,000 pounds loaded and it was six and a half hours total time. If you relate it back it will not be in exact proportion, but then it will be somewhat in relation to that. A fifteen thousand pound load is fairly light. You should get three thousand pounds an hour and so you should do it in five hours.

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Our next speaker is **Joseph Beegle** of Beegle Associates, Inc., Chicago, Illinois, who will talk to us on "Plastic Coating of Steel Wire."

(Mr. Beegle then presented his paper.) (Applause)

DISCUSSION

Question: You talked about two hundred feet a minute — at what length?

Mr. Beegle: Thirteen feet. The heating elements are about eleven and a half feet.

Question: Do you sell the equipment or the wire?

Mr. Beegle: We sell paint.

Question: Are you able to do it with galvanized wire at those speeds?

Mr. Beegle: That is too slick a surface to give decent adhesion.

Mr. Matzen: I know that the speakers are all thankful for your attention and your questions, as well as your great display of interest.

(The meeting adjourned at 3:30 P.M.)

FERROUS SESSION WEDNESDAY MORNING

November 16, 1955

The Ferrous Section session convened at 9:35 o'clock, **W. R. Cook,** Superintendent, Wire Mill, Union Wire Rope Corporation, Kansas City, Missouri, presiding.

Mr. Cook: Our discussion this morning evolves around the subject of psychology and that is always an interesting subject to all.

Our first speaker this morning will be **Glenn R. Lee,** Superintendent, Wire Department, Continental Steel Corporation, Kokomo, Indiana, who will give us his paper entitled: "A Practical Psychological Approach to Quality Control."

(Mr. Lee then read his prepared paper.) (Applause)

DISCUSSION

Question: I presume that these meetings with the members of the working force were held in the evening?

Mr. Lee: They were held in the morning between ten and eleven. This program lasted about six months and we had three meetings a week. In that way we were able to get all three turns.

Question: You did not shut down the mill for the meeting?

Mr. Lee: We did shut the jobs down when the boys came in.

Question: How did you pay them — on a regular piecework or daywork rate?

Mr. Lee: We paid them either the classification rate or the average tonnage rate — whatever they worked on.

Question: How long did the meetings last?

Mr. Lee: We had intended to hold the meetings to an hour and a half but then the discussion held the meetings longer than that. We were surprised at the amount of discussion we actually had on some of these problems. As much as we could, we held the meetings to an hour and a half but then at times we became involved in some problems and they thus did not adhere to that.

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Our next speaker this morning will be **Thomas C. Miller,** Technical Director, National Gypsum Company, Buffalo, N. Y. He will talk to us on "Factors Affecting the Characteristics of Ca $(OH)_2$ in Suspension, with Special Reference to the Wire Drawing Industry."

(Mr. Miller then read his prepared paper.) (Applause)

DISCUSSION

Question: In not using submerged heating how would you control the temperature of your line?

Mr. Miller: The live steam goes into the tank near the bottom. We suggest that the live steam be introduced about six to twelve inches from the bottom because lime is not a pure product and by putting the steam pipe about six inches from the bottom it allows the impurities to settle.

Question: Is it possible to set up a test so that we as wire drawers can determine what the particle size is?

Mr. Miller: Yes, but I cannot give you an easy answer. The only thing that I can say in that connection is that I have been using an instrument developed at Standard Designs and which was developed for Portland Cement. I have modified that in order to fit the needs for calcium hydroxide. The Precision Scientific Company here in Chicago will make that modification, adapting it for calcium hydroxide. The whole instrument, including modification, is $138.

Question: How do you get the steam into the bath, externally?

Mr. Miller: Yes. In two instances in the Pittsburgh area they built a tank according to our suggestions. I don't know the exact dimensions but it was about eight by sixteen feet and about six feet deep. Six inches from the bottom they had a three-inch pipe welded to the outside of the tank and to that pipe they attached the steam line and they simply controlled that by a valve from the outside. We know that this tank has been used continuously since May without any difficulty.

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Our next speaker is **Dr. Fritz Schwier,** Chief Engineer, Felten & Guilleaume Carlswerk, Koeln-Muelheim, Germany. He will talk to us on the subject: "Stress Corrosion and Relaxation of High Carbon Steel Wire for Prestressed Concrete."

(Dr. Schwier then presented his paper.) (Applause)

DISCUSSION

Question: I presume that these are basic open hearth stills?

Dr. Schwier: Yes.

Question: When you speak of silicon steel, what is the silicon content?

Dr. Schwier: .272 per cent.

Mr. Cook: That is in the paper.

Question: What caused you to choose that particular chemical for corrosion tests?

Dr. Schwier: It had been shown that the nitrates were more corrosive. That is, in all steels under stress it is the nitrate that does the damage. I think it is important to know that of all the many agents that have been tried by a lot of people that the nitrates so far have been the only ones that produced the typical stress. I don't think it makes any difference.

Question: We have made tests that confirm what the doctor says and in connection with the materials used for stress corrosion nitrates are very effective with almost all other corroding materials, such as salt solution.

Mr. Cook: We wish to thank you, Dr. Schwier, for your presence here and for the presentation of that fine paper.

(The meeting adjourned at 11:40 A.M.)

Non-Ferrous Section Discussions

MONDAY AFTERNOON SESSION
NOVEMBER 14, 1955

The Non-Ferrous Section convened at one-forty o'clock P.M. **Charles M. Frederickson,** Asst. Plant Supt., Kaiser Aluminum and Chemical Corp., Newark, Ohio, Chairman of the meeting, presiding.

Chairman Frederickson: The first paper this afternoon is entitled, "Progressive Work Hardening and Reannealing of Five Brands of High Conductivity Copper," by **M. V. Yokelson,** Research Metallurgist, General Cable Corporation, Bayonne, N. J. and **Dr. M. Balicki,** Professor of Metallurgical Engineering, Polytechnic Institute of Brooklyn; to be presented by Mr. Yokelson.

[Mr. Yokelson read his prepared paper.] [Applause]

DISCUSSION

Chairman Frederickson: While the questions are being prepared and forwarded, at the risk of sounding slightly commercial, would you care to comment on whether or not this technique might be used for aluminum?

Mr. Yokelson: Yes, Charlie. It can be used for any instance where you have a material that has been work-hardened by rolling or drawing, where you want to find out the annealing characteristics. I don't care whether it's aluminum, aluminum alloy, copper, the brasses, nickel, iron — it can be used for anything. We have used it for aluminum. We have used it for some aluminum alloys. I have used it for phosphor-bronze, and used it for brass.

Question: Could you show better how you get all of these wires into the furnace at one time?

Answer: Yes. We just have a round copper block. Our furnace is actually about 2½ inches in diameter, and we have longitudinal slots around the periphery. The block is, say, 15 inches long. We just have a bunch of slots all around it, running longitudinally. Actually, I have about 25 availabe slots. We put two No. 12 wires into each slot; that gives us a capacity of 50 wires.

Question: What affects change in stability? Is it the result of chemical analysis, is it oxide, or something else?

Answer: Actually, your change in thermal stability characteristics is dependent upon several factors. Number 1 is the basic chemical composition of the material. Number 2 is the entire processing history of your wire sample—that is, whether the rod, for instance, was quenched when it came off the hot mill, whether you retained certain impurities in solution, or whether they were precipitated from solid solution; the drafting sequence employed in reducing from the rod down to the finished wire stage, the drawing speed. All of these things are incorporated in the annealing characteristics of your wire, so you have to go all the way back to your refinery first, and you have to know more than just your chemical composition.

Question: The method for determining uniform elongation is questionable, and is this really "acceptable?"

Answer: We used uniform elongation; it was convenient for us, and it was merely used as a structural change in tests. When you take these wires out of the furnace, if you prefer to run stiffness tests or other types of ductility tests, or tests for any other property which you would like to determine, your specimens are there, and you can use any properties you like.

Question: Have you found that — for any supplier of copper — the same results are generally reproducible from shipment to shipment?

Answer: Yes, we have, but we have also found that you can't bank on it too well, particularly today, in times of a copper shortage, for instance. Some copper refineries used to process blister copper which came from a particular mine field, was mined in certain places, and consistently had the same pattern of impurities in the blister copper; therefore, the same pattern of impurities showed up in the refined copper. Today, copper refineries will refine anything that is copper-bearing that they can get their hands on, so don't bank on brands of copper being reproducible today. You'd better check every heat.

Question: The curves shown plot mechanical properties for copper brought to a specified temperature, with no holding time at the temperature. Just what will happen to these curves if the element of time were added to the curves? For example, will the initial softening temperature be lower than shown if a fully hardened copper is held at, say, 175 C. for an hour?

Answer: Yes. If you bring in holding time, this is the same as reducing the heating rate, as we showed in those curves. When we reduced the heating rate, the entire curve shifted to the left. In other words, your entire softening range decreased. You would get the same effect by holding it.

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Chairman Frederickson: The second paper this afternoon is entitled "Effect of Cold Reduction on Some Properties of Nickel Wire," by **G. A. Nelson,** Sylvania Electric Products, Inc., Warren, Pa.

[Mr. Nelson read his prepared paper.] [Applause]

DISCUSSION

Question: The sharp drop in tensile strength shown in the annealed permanickel above 90 per cent reduction is not seen in the case of the yield point for the same case?

Answer: Actually, the drop is not as noticeable. I feel that perhaps the explanation for this lies in the fact that for a given group of samples at the 98 per cent reduction point, we are very near the fracture point of the wire, and that this point may be quite unstable; therefore, in some cases we may see it and may not.

I believe there is a slight drop there. It is not quite as noticeable in yield as it is in tensile strength, particularly in the higher state.

Question: Under what conditions does hardening in permanickel occur, and how much — versus how much age-hardening —occurs, and under what conditions does it best occur?

Answer: According to the information we get from International Nickel on this hardening, it takes place by a drawing temperature of about 900 or 950 degrees Fahrenheit, after a considerable time with these temperatures up to possibly as long as ten hours.

As far as we have been able to measure, there is no appreciable age-hardening that takes place at room temperature. In other words, if you have a material which is quenched properly from the correct temperature, and you do draw it back for a period of time, somewhere, at the temperatures I mentioned, you do get noticeable precipitation hardening.

Question: How much?

Answer: I'm not sure that I have the answer to that question at my fingertips, but it would be in the range of several thousand psi.

Question: Can you correlate microstructure with physical properties after annealing, showing ranges of recovery and recrystallization?

Answer: In general, I would say that the correlation in microstructure is reasonably good. It is not reproducible exactly in the samples that we have seen, but we would note, for example, that on a material such as permanickel, when we pass the critical temperature, we would have a sharp change in physical properties as a result of the grain structure change. Also, grain structure affects elongation. I didn't mention that in going along, but we found that if we are interested in maximum elongations, materials having minimum grain structure for a given set of properties will give us the best elongation values.

Question: What is the cobalt content of each of the three alloys discussed?

Answer: I'll have to bow to International Nickel on this point. I have no idea.

★ ★ ★

Chairman Frederickson: The third paper on this afternoon's program is entitled, "Drawing and Processing of Titanium Wire," by **D. H. Wilson,** Rem-Cru Titanium, Inc., Midland, Pa.

[Mr. Wilson read his prepared paper.] [Applause]

DISCUSSION

Question: Can you elaborate on 3 per cent oxidizing atmosphere?

Answer: Yes, a little bit. The atmosphere of the furnace is checked by the normal Orsatz method and controlled only to that degree. The gas-fired furnaces and the atmosphere are checked in a normal manner. I'm not too familiar with the exact procedure, but I believe it's piped off and analyzed.

Question: What type soap was used as a lubricant with the molysulfide? Would particle size make a difference?

Answer: The soap that we used was Steelskin or Rome soap. As to the particle size, I'm sorry; I don't know. I don't believe it has made any difference.

Question: The other part of that question, if I heard it right, also had something to do with molysulfide.

Answer: I believe I gave you the molysulfide composition. I believe it's about 5 parts soap and 1 part moly.

Question: Some years ago we encountered brittleness in commercially pure titanium wire, about .010" in diameter. Has this problem now been licked?

Answer: I believe it has. The brittleness of the wire is due to two causes. It is what we call interstitials, one of which may be hydrogen; others are oxygen, nitrogen, carbon, and even something as metallic as iron. These will cause wire to be very brittle. The protection against those interstitials, or the removal of them, will leave a good, ductile wire.

Chairman Frederickson: The next question is in three parts. Part 1: Did the molysulfide draw coat have any detrimental effect on the surface of the wire after annealing? Part 2: Or was it removed? And, Part 3: If so, how?

Answer: Before your annealing, you have to remove all lubricants. That is done by a straight caustic pickle of the 300 series. I think most of you are familiar with the straight stainless 300 series pickle, caustic tank. If you leave any film, any material with carbon or any material such as soap that will break down under the atmosphere or under temperatures of around 1300°, carbon, oxygen, nitrogen and hydrogen will be absorbed into the surface.

Question: Please report, if you will, for titanium wire: 1) Maximum reduction per pass. 2) The maximum total reduction before annealing. 3) The number of passes to get the maximum total reduction.

Answer: I hope I'm good in my mathematics. We have actually obtained reductions as great as 50 per cent in a single pass and have a total as great as 75 per cent, combined passes, between anneals.

Now, to approach these, by good mathematics, you can combine these with any type of reductions. You can achieve this in two passes. Most of the time, to achieve this, we will probably use three.

Question: Has hot drawing ever been attempted, and if so, has it proved satisfactory?

Answer: I'm sure that the person who proposed the question knows that hot drawing has been attempted. It's not secret to that degree. It is in the experimental stage, and its success is a matter of degree and a matter of opinion.

There is a great deal to do before hot drawing is going to be what we are looking for.

Question: Are the same lubricants used for fabricating fasteners?

Answer: I'm not sure whether I can answer that.

I had the privilege of visiting one company that has the only government contract for fasteners for the aircraft industry, and they have a very fine plant. I don't know what lubricants they were using.

There are two operations. Basically, one is a hot one, which is usually needed for the heading operation; the rest is cold, such as the rolling of the threads.

Again, just as a personal opinion, outside of the hot working, I would say that a little oxide film probably would aid the cold operation. Again, you have to remove your oxide, which would be a problem.

Question: What temperature do you use for welding wire? How is the surface of wire cleaned for welding purposes?

Answer: This is after it is used for welding. You have a welded part, a fabricated part for welding, I take it. You go back to its normal annealing temperatures.

Question: I wanted to know if you could draw at one pass and use it for welding wire. After you draw the wire, can you straighten and cut it, or put it on a spool, or do you have to anneal it first?

Answer: Our wire that we sell can be spooled and cut. There is a certain amount of cold work. I know it has been done with as much as 10 per cent cold work. It can be handled.

Normally, we anneal everything prior to spooling or straightening. The surface of the wire is cleaned for welding—the wire is cleaned prior to spooling. We are talking about automatic welding.

If we are talking about bar lengths, such as 3-foot lengths or so, the wire can be cleaned afterward by acid pickle—300 series acid pickle and nitric hydrofluorine will clean and remove any dirt. It is generally suggested that the wire and the welds be very clean. We are quite careful about our spools and wire that we are going to ship for welding.

Question: Has any work been done on lubricants for hot forging? If so, what type? This is well beyond the scope of the paper, but would you care to comment?

Answer: Well, a little bit. I think a lot of us would like to know what other people are using. It's a beautiful way of dodging the answer. We started out in the industry, and I had the opportunity of visiting some plants who used just a good, old fashioned gravity oil solution. and they daubed their dies with a hand swab. Exactly what is in this, I don't know. Each one of the forge houses thinks it has the real answer. I can tell you they are all doing a good job.

Question: Is reliming between drafts beneficial in maintaining a continuous oxide film?

Answer: It is not only beneficial; it is necessary. If you do remove the lime and soap pretty well, what we often do is go back and give it a lime dip. In some cases we can go right on, but again, you have to be careful.

Titanium is a treacherous devil, and it pays to be cautious. The lime dip does help and act as a carrier.

Question: I had intended that to mean between drafts.

Answer: That's what I was referring to; I took it that way.

In cleaning before intermediate annealing there are no great precautions that I know of, except that you have to have an atmosphere fairly well controlled. You should be careful that there is not, certainly, a reducing atmosphere, and that you don't go too high or to too long a temperature, because the scale then becomes completely oxidized, and you form a surface component, titanium oxide. TiO_2, which is powder, and it doesn't hold up very well. It's this tight blue scale that is titanium oxide, and will stand this drawing.

Question: Under some conditions I get a yellowish green scale on it?

Answer: That is reducing atmosphere, generally, and probably a little high temperature too long in the reducing atmosphere. Your coil will tend to give you a greenish scale.

Question: You briefly mentioned sulfurized dies. Do they show any value? Also were they sulfurized tungsten carbide dies, or steel dies?

Answer: I'm afraid I can't answer this. The only part I know of that is that sulfurized steel dies didn't hold up very well.

It was very quickly found that we didn't spend the time and effort in checking all the various types of scale that could be investigated. There were too many other problems, and it was because of the use of the carbide dies and the good progress shown, the results, that we didn't bother going too far into it.

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Chairman Frederickson: We will proceed now to the next paper, which is entitled "Ductility Tests for Electrical Conductors." The author is **Louis Boleraski,** Research Engineer, Kaiser Aluminum & Chemical Corp., Division of Metallurgical Research, Spokane, Wash.

[Mr. Boleraski read his prepared paper.] [Applause]

DISCUSSION

Question: On the 90-degree bend test, what effect does the rate of bend have on the results?

Answer: Very little. We have tried making bends very slowly, and rapidly, and find that it correlates rather well.

Question: I'm wondering whether standardizing agencies like ASTM should not incorporate tests, such as you have described, into the specifications, in addition to the normal tensile and elongation tests which are presently specified, and let it go at that?

Answer: Yes, I think they probably will.

The ASTM methods cover steel radii, and bending radii. That has not proven a problem with copper or steel, but with aluminum it has. Any imperfection in aluminum strands will show up rapidly. We have used the notch test, and we have varied our notches in the samples from 2 to 10 per cent, and there is considerable difference.

★ ★ ★

Chairman Frederickson: The fifth and

final paper this afternoon is entitled, "Wax Lubricants in Non-Ferrous Wire Drawing," by **John A. Werner**, Field Engineer, S. C. Johnson & Son, Inc., Racine, Wis.

[Mr. Werner read his prepared paper.] [Applause]

DISCUSSION

Question: How would it affect enameling wire?

Answer: If you draw wire with wax, there is a wax coating left on the wire. That wax on the wire was measured for us, and it turns out to be 1 molecule thick, or .0004 of a milligram per square inch. It volatilizes off at 468°F. I'm talking about the wax and water now, not wax and oil.

We have successfully enamelled wire without cleaning it. These enamels have a volatile, solvent base. You may have some synthetic enamels that I know nothing about. I know that some of the big concerns have run right through enamel wire with the wax in place without cleaning it, and they have been successful.

The same thing has happened in tinning. Tinned wire has been made with wax on it, so you might consider that. I would suggest giving it a try. I don't know what your enamel is or what your process is, but I have seen a lot of them, and a lot of them look really good.

Question: After you run a while, how do you test to find out whether your solution is 20 to 1 or not?

Answer: We have a method of breaking the emulsion, using a sodium sulfate salt. You can check it that way, or use the standard Babcock method.

Comment: The Babcock won't work.

Mr. Werner: Did you try it?

Comment: Yes.

Mr. Werner: It won't break with acid, incidentally. You can't break this emulsion with acid. You can pour it in, and all you get is an unholy mess if you pour in enough. If you pour in the amount you think would usually break an emulsion, nothing happens.

We have had quite a go-around on the sodium sulfate method, and we find that to be the most accurate in breaking this emulsion to determine whether or not it's 20 to 1 or 30 to 1. You get a certain collar of solids on the top. The solids don't look the same as an oil-type solid. That's where the go-around comes along.

There is a time limit set on it. You break the emulsion with the sulfate, allow it to stand, and the solids rise to the top as a flocculent mass, and ten minutes later they are compacted. We put a ten-minute time limit on it. At the end of ten minutes, you check the thickness of the wax solids, and then you have a rule to check as to whether it's 20 to 1 or not.

Question: Can you filter waxes without losing your wax in the filter paper?

Answer: Yes. The particle size of these particular waxes in the emulsion is 1/500 of a micron in size. That is the wax emulsion. We believe that is one of the primary reasons for the success of this emulsion, because it has such a fine particle size. The particle size of the wax in oil is 1 micron; that's the largest. That, too, can be filtered successfully.

Question: Through any type of filter?

Answer: Through any type of filter that does not — shall we say — get more efficient as you go along. We have had a great deal of investigation into the filter area; we find that the maintenance of a filter is more costly than throwing the solution away. Because of this, as you filter through, if you have a 40-micron filter and you are passing our wax through, or some other material, this filter material finally becomes more and more efficient because of its pickup of the dirt or fines, and that 40 micron filter gets down to 30, 20, 10 and 5, and pretty soon nothing goes through.

We have had a lot of investigation in this area, and have found that most people have given up at this point in looking for a method of cleaning their wax or any other lubricant in wire drawing by filters. They are looking for some other method right now. Filters have proven to be pretty much of a headache, although some of them are rather efficient.

Question: Have you had any experience with the same type of material in steel or stainless?

Answer: We have had quite a lot in drawing stainless steel wire, alloy steel wire, using our oil dispersion of wax. We make what we call a chlorinated wax, which is a chemical composition of wax and chlorine dispersed in oil, giving you an EP film besides the wax film. Those wires are in fine sizes. Right now we are drawing wire that is approximately about .070 down to .012, say, in a machine like the Vaughn Ringblox. These are stainless and alloy steels.

We are going further with it, however. We're getting people to try the rods and so on, to see what would happen. However, most steel mills are set up with the dry soap box and the surface treatments, and we're a little bit reluctant to go into the wet drawing of stainless or carbon steel wire, such as fence wire.

Question: How fine has copper wire been drawn?

Answer: We have gone down to .003; that's the only experience I have in fineness of copper wire; .0025, I think, was the final size.

Question: What is the life of the wax lubricant?

Answer: We haven't established any definite life in copper wire drawing. The people who tried it two years ago are still running it. They take it out, as you know, allow it to stand, and settle out the fines, and use it again with additional mix. They find that the drag-out is much less — about one-third less — than the usual mixtures. But the life has been beyond us. As a matter of fact, it's too long, frankly.

Question: How hot can you run the lube?

Answer: The efficiency is best between 85 and 95; I have run it as high as 135. We have found that over 135 degrees it tends to melt the solid wax particles, and they lose some of their efficiency. However, they do not become destroyed; you don't lose them. They reform again and come back.

We are depending on our cooling a great deal in what we call the theory or fact of latent heat, where these solid particles melt, absorb heat in the very physical act of melting, and then reform and perform that operation over again.

If you bring them up to 140, you have melted them completely, and you don't get the benefit of the cooling effect, although the lubricating effect is still there.

Question: Will this wax protect the finished wire surface for any length of time?

Answer: This has been one of the big reasons for people switching to wax lubricants. After drawing these wires with wax, we leave a continuous film of wax on it which does prevent the surface from oxidizing or becoming pitted or being damaged by water, for instance. That has been one of the primary advantages of this material, especially in aluminum wire, screen wire. It has been a boon.

You find that by the time the ordinary lubricant is used in drawing the wire, and it is made into screen and rolled up, and finally sent to the ultimate user, it's not very bright. That is what sells this particular screen wire. It has to be bright and look good. The wax protects the finish.

The length of time, of course, is dependent upon what abuse it gets. Under normal handling in your shop, shipping to the final user, you will find it stands up very well. We cannot set a length of time. Some of it will last three months and some will last three weeks, depending on what happens to it. But is has the protection that waxes give it.

Let's put it this way. You wouldn't take a car that hasn't been painted and waxed, because it won't last six or eight weeks. Why? Because wax is polar. It will stick on, to be sure, but the continuous film is sometimes broken, and when you get water through it, or some active agent under it, it tries to lift the rest off, causing corrosion to occur.

Question: You state you use a 5 per cent wax emulsion for drawing copper wire. Is this used for all final sizes drawn?

Answer: That is correct, although I feel we wouldn't have to go that heavy for the fine sizes. The advantage is that we can draw the rod and the fine sizes from one tank, and we can go to 20 to 1 or 5 per cent. You wouldn't have to go that far for the fine wire. I feel we could probably go to 25, 30 or 40 to 1 for those fine wires, but no one has tried that yet, simply because of this fact, that corrosion is always present when you use water. We say water is our best friend and our worst enemy, and that's true.

We could extend the corrosion-inhibiting properties of this material so far that you might run into trouble from—let's face it—rust, so we don't say to go beyond 20.

Water conditions are different all through the country, and that's why we like to establish one that will take care of them all. But it's up to you. You can try it and see how far you can go back with it.

Question: What effect has the residual wax on the wire of soldering properties?

Answer: This may come as a surprise to many of you, but some years back—maybe 20 or so—waxes were used as soldering flux, and these waxes appeared to have that same value in soldering on this particular copper wire that we draw. It seems to aid rather than deter the soldering properties of copper wire. I think it is because it keeps the surface cleaner, myself. I think it prevents the surface from oxidizing, and you have a better soldering surface and one that will tin easier.

Question: What is the limiting factor on tank life for copper drawing if you don't form soaps?"

Answer: There are a few limiting factors. I said the life is too long. The only limiting factor that we have found up to this point is that the copper flakes from the wire, these fine particles eventually become quite thick, and the solution becomes dirty. Then if it is allowed to settle, these particles fall down. All of them can't, necessarily, because they are fine. They are in a colloidal suspension.

That's the only one I know of except outside contamination by dirt being poured in through the surface, contaminated by lying around the shop. As you draw it, your solution becomes dirty, but there is no limiting factor on it that I have discovered yet. A lot of people are using it now, and find it to be fantastically long-lived.

The waxes are non-deteriorating. They are almost inert, as waxes generally are. You don't find them reverting into something else; they stay put.

There is one factor that might enter into this thing that just struck me now. There is a rancidity problem in some places, where lubricants turn rancid because of bacteria, but that isn't too much of a problem any more. We have searched for reasons for rancidity, and have found the little bugs that do that, and we have arranged to have certain correctives to cure a rancid lubricant tank.

Question: Is a wax that adheres to wire after drawing difficult to remove?

Answer: There's always a little story that goes along with it. It is not difficult to remove. However, you must use a method designed to remove wax.

For instance, any alkaline solution that you would use to remove wax must be heated to 180 degrees or more. It must melt the waxes, so as to emulsify them or float them off, one or the other. If you're running through some type of solvent degreaser, either vapor or liquid, that must also be heated to 180 degrees or higher to melt those waxes and to float them off.

It's like this: if you've got printers' ink on your hands, and you take a bar of soap and try to wash it, it won't come off. You would not condemn the soap, nor would you condemn the printers' ink. You immediately say to youself, "Look, soap doesn't take it off. Something else must." So you try an ink solvent, and it comes off readily. So you don't say "That's the best cleaner in the world." You say, "That cleaner is to take off printers' ink, and this soap is to take off oil." One is for one condition and the other is for another.

In doing the same thing here in cleaning waxes, you must use the methods designed to take off wax. That method must include heat.

Question: In order to emulsify waxes, are dispersant agents added? And do not these dispersants destroy a certain amount of polarity?

Answer: In the dispersion of waxes, yes, a dispersant agent is used. In the emulsified waxes, an emulsifying agent is used. These agents then wrap themselves around the wax particles to keep them in solution or dispersion. We do lose some of the polarity right there, but what we are dependent on in its entirety is the heat of the work that we are doing. As soon as we get to that point with these wax particles, these dispersant and emulsifying agents are somewhat volatile and leave, allowing the waxes to completely cover the wire as it is being drawn. These wax particles are lost, of course, but there are literally uncountable numbers in each one of these two products—the dispersion and the emulsion.

So it does lose some of its polarity, but it does do the job as it gets to the heat zone, and you all know that is pretty high in the die.

Question: Do you have any experience with tinplating copper drawn wire?

Answer: There is a peculiar thing concerning tinplating. We have found that waxes really love tin, and when we get into tin wire, we have to be careful because they really go toward it.

We found this to be true some years back, when people were using galvanized tanks and pails and so on in the shops. We put wax in these galvanized pails and found out that the whole pail would be coated with wax. It was completely attracted by any tin material.

We used to pack the wax we make now in tin can samples, with soldered seams. The wax would go right for that tin seam; that lead-tin seam would really pick it up.

So when you get into the tinned area, we say "Stay away from our wax. We're in trouble." And we know it. We don't want you to find out before we tell you.

Question: Can't you clean the wax off prior to the tinning?

Answer: Are you speaking of tinning the wire after drawing the wax?

Question: Electroplating.

Answer: You have no problem there. I thought you were drawing tinned wire. If your wire is in the wax solution for any length of time, it will pick up a great deal of wax. It just kind of gravitates toward it. But if you're just tinning a wire after drawing it with wax, you have no problem. You run it right through your tin bath, the way you always do. You don't have to clean it. It will come out perfectly tinned, and there won't be any problem involved.

Question: Can you tell me what range of copper wires can be drawn in one solution?

Answer: One solution covers a range from the 3/8 rod breakdown to whatever you want to draw.

Quetion: You mean one concentration?

Answer: One concentration. Ridiculous, isn't it?

We'd like to work with you. If you want to try it, we'll be happy to supply it for you. If it doesn't do what we say it will do, you haven't bought a thing. We haven't had any problems yet on this score.

Chairman Frederickson: In closing, then, I'd like to personally congratulate the authors of this afternoon's program for their excellent job of preparation, their excellent job of presentation and condensation and, above all, for the perfectly frank, free way that they have answered the questions that have come up from the floor.

[The meeting adjourned at four twenty-five o'clock.]

TUESDAY MORNING

November 15, 1955

The meeting convened at nine o'clock, **Willard de C. Crater,** Manager Vinyl Sales, Naugatuck Chemical Division, U. S. Rubber Co., presiding.

Charles A. Windsor, Manager Wire Equipment Division of the Michigan Oven Co., Detroit, Mich., read a prepared paper entitled, "The Treatment of Copper Conductors in High Velocity Recirculating Type Gas-Fired Ovens." . . . (Applause)

DISCUSSION

Question: In recirculating type ovens the fume-laden air passes over a flame. This heat can decompose fumes from some enamels causing oven fouling. In what way do you cope with that problem?

Answer: I think you are talking about silicons. Silicons that pass through an open gas flame will give off a product called silica ash, in lieu of a better term, and there is no effective way to cope with it except to take the catalysts out frequently and clean them. When I say frequently, it depends upon the concentration of material that is being used in the oven. Ordinarily cleaning once or twice a week in trichloroethylene will remove sufficient silica ash to enable the unit to be put back into production.

Question: As an equipment manufacturer you can frequently observe the new trends in industry. Basically you are speaking about enamels. Have you noticed any trends toward the use of dispersions in vinyls or ethyl derivatives?

Answer: I am glad you asked that question. Not in the wire enameling field but in the cloth coating industry. We have used the same principle very successfully on a number of existing insulations. And I can anticipate another question, that is, the elimination of the sail effect within the oven. That is done by balancing the recirculation on both sides of the cloth so that the cloth remains practically neutral.

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H. L. Bullock read a paper prepared by **C. A. Litzler,** President of the **C. A. Litzler Co.,** Cleveland, Ohio, entitled, "Solution Coating of Copper Wire." . . . (Applause)

DISCUSSION

Question: What are the maximum thicknesses for vinyl plastisol coatings and what tolerances can be expected?

Answer: We do know that, for instance, in providing for a system of this type that usually the customer specifies the thickness of coating that he requires and uses his requirements as a basis. That is what we base our design on.

Question: Does the thickness of coating obtainable depend on wire size?

Answer: I think it does. A large wire will carry more current and consequently probably require more insulation to stand up under the required tests.

Question: Are sizing dies used in Teflon coating processes?

Answer: Yes, they are. The same type of sizing dies which you saw in one of the slides.

Question: You spoke in the paper of enamel, vinyls and so forth. Have you seen any trends in the industry toward the increased use of thermoplastics?

Answer: I think there is a very definite trend toward the vinyls. In answer to the first question about sizes out of wire, I think the wire people have

been a little backwards in trying to put out a lot in a hurry. Due to the severity of a lot of your insulation tests there they are a little afraid of it.

I have more to do with the textile end and also with protective coatings and there they have put on three-sixteenths to a quarter of an inch of the vinyl plastisol and successfully cured it in one coat. Now, I don't know what your wire people can do and still not have any little air holes there that will reduce insulation.

Question: Have you noticed in your industry the trend to replace textiles where you use textile insulated wire with your process as an industry?

Answer: With the chemistry of coatings coming along as they have in the past there are more and more wires covered by vinyls and Teflons and so forth.

Answer: You notice with the increasing electric load in houses that we are getting a new development in wires that are suitable for installation in old houses where you need either a smaller diameter with a better insulation to give you a wire that can be pulled through the same conduits, or a plastic and weatherproof insulation where the wire can be pulled under the floors and up the walls. A lot of your wire manufacturers are just trying to gauge when we are going to replace wire in the houses before we burn it all out with increased electric loads.

Question: General costs of coating equipment. A lot of the gentlemen here are extruders and they know what they cost. You don't have to answer this. What is the average price for average installation of an enameling system.

Answer: I would say the average price of equipment such as you saw in the first slide probably will run around thirty of forty thousand dollars. That would be tempered by what the actual requirement is; in other words, what the physical size is. That system was designed to operate at sixty feet a minute maximum.

★ ★ ★

. . . **J. A. Snyder** delivered a prepared paper written by **R. J. Lurie** and Mr. Snyder, Development Engineers of the **Bakelite Company,** New York, entitled "Recent Developments in Polyethylene Insulating Materials." . . . [Applause]

DISCUSSION

Question: Are data presented on the Zeigler or Phillips processes?

Answer: The data is data obtained from resins made using the Zeigler process.

Question: Your Figure 3 shows a stress of psi x 10^{-3}. The figuring looks wrong. Shouldn't it have been ten to the three?

Answer: Well, the implication of the use of ten to the minus three is that the figures that are given on the scale were obtained by multiplying the true value by ten to the minus three, so that the figures that were given were correct as we interpreted them.

Question: How does the flow characteristics of a low pressure polyethylene compare with common vinyls that are used for building wire?

Answer: This is a very good question and because I am not too familiar with the vinyl compounds I cannot answer it directly. Mr. Higgins or Mr. Lurie may be able to answer that question.

Answer: Possibly your test is a five hundred gram flow. That is a standard Underwriter's test that we used. The deformation of the vinyls usually is a much more gradually rising curve. Using polyethylene with the A polymer, you come along at ninety-five and it begins to break sharply and at one hundred and ten it is completely gone. Vinyls would start at a lower temperature and end up at about one hundred twenty degrees with a much lower deformation. Is that what was meant by that question?

Question: I think what they wanted you to do is to compare the Underwriter's standards—what you said is correct. You have a sharper annealing point at higher temperatures. What this person wants to know is a value as tested by the Underwriter's methods of test. In order words, standard insulation on building wire.

Answer: You have up to fifty per cent on vinyls. That's what you are allowed. Normally you run half of that. We found that polyethylene with the A polymer went straight up. With the vinyls, running it over the same temperature range, you might get something like that where the amount allowed by Underwriter's is fifty per cent at one twenty.

Question: Can the polymer be made flame retardant and what effect does such treatment have on other characteristics?

Answer: First answer is they can be made flame retardant by incorporating the same ingredients that are used in high pressure polymers. Second answer is that with the incorporation of a great amount of filler we would naturally degrade the flexibility at low temperature, the ultimate elongation and other properties which are dependent upon the amount of filler used in a polymer.

Question: Cost differences of low pressure versus high pressure.

Answer: First and simplest answer to this question is that there is one manufacturer who is offering small sample quantities at a price of forty-three cents per pound. It is our belief through some extensive cost estimating that these materials, although they will eventually become available at lower prices, are near to those we are now using for the high pressure polymers. They will be slightly more expensive.

Question: Low water absorption is one of the most important characteristics for some installations, especially for submarine use and wet locations. How does low pressure compare with high pressure in milligrams per square inch or percent increase in capacity?

Answer: I can answer your question very generally, but I cannot give you the exact data. That is because with the increase of crystallinity, the moisture resistance or moisture vapor transmission of the low pressure polymers will be better, or the amount of moisture that can pass through a shielding of the low pressure polymers will be less than the amount that can pass through the same thickness of shielding of the very high pressure polymers.

Question: Can you give some indication of the order of magnitude there? Would it be two to one or three to one improvement?

Answer: No, I cannot. We haven't run that test. The film group are interested in that, of course, and they have some actual data, but we don't have that data with us.

Question: I understand from the chart that was sketched on the board that the low pressure polymer would not meet the Underwriter's for flow, is that right?

Answer: The curve I have drawn is for the high pressure polymer. The low pressure would meet it. I don't remember the exact curve but the low pressure deformation starts somewhere around one hundred and twenty-five degrees centigrade. You get almost zero deformation with it.

Comment: Polyethylene is not approved in general for building wire.

Question: I grant you that, but I want to ask if the speaker's intent was we can now think about expanding the uses of polyethylene.

Answer: That's the idea.

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. . . **W. W. Spohn** presented a paper prepared by Mr. Spohn and **S. P. Foster,** Development and Service Section, **E. I. du Pont de Nemours and Company,** Wilmington, Del., entitled "Accelerated Heat Aging of Polyethylene." . . . [Applause]

DISCUSSION

Question: Are data on samples removed from wire or on molded A.S.T.M. die cut specimens?

Answer: Almost all of the data was on insulation removed from wire.

Question: At times after extruding onto wire polyethylene insulation has practically no elongation. What causes this condition?

Answer: We have found that extrusion conditions probably have more to do with the finished product than any one thing.

Comment: I can add something to that I think. You stress a polyethylene sample. Strain, that's the distance that you pull it. You get a typical curve like this and this and it breaks off . . . During extrusion you have too much elongation, which is a measure of this strain. You can add any place along this line. The more you draw it down the further you get toward the point here. So this just measures residual elongation of wire coating. If you are extruding with too much draw-down, you get too close to the critical point and you only have this little bit of residual elongation left.

Question: Were the original densities in Table 1 and Figure 2 obtained from annealed samples?

Answer: They were not primarily because annealed samples would be one hour in aging at one hundred degrees centigrade and we wanted to start at zero aging so we could compare with the twenty-four hour aging.

Question: On your electrical degradation, did you make any measurements during the study at all?

Answer: Only in the case where we would mill for six hours at one hundred sixty degrees. Then we measured power factors and dielectric constant. That is a very sensitive test for oxidated degradation and in either case milling for six hours did not change the electric properties at all.

Question: Many of your tests conducted here were up to forty-eight hours. Does that correspond with longer term aging data at those temperatures? For example, one, two, three, six months?

Answer: After you have reached forty-eight hours your increase in crystallinity

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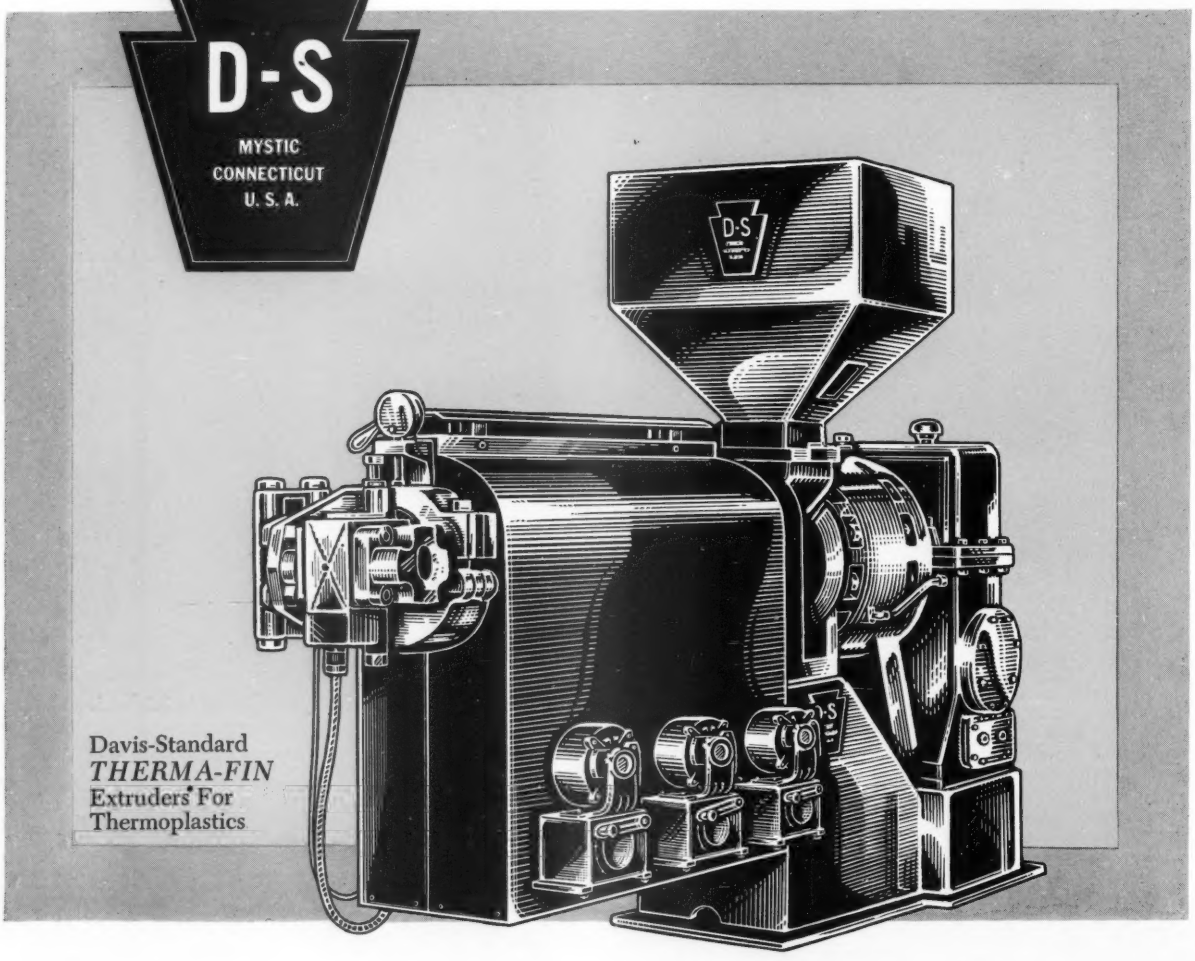

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is pretty well levelled off. I might say that forty-eight would be at several years room temperature in normal wire coating application temperatures.

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. . . The session was adjourned at eleven thirty o'clock . . .

TUESDAY AFTERNOON

November 15, 1955

The meeting convened at one-thirty o'clock P.M., **Hugo W. Biskeborn**, Director of Manufacturing, **The Ansonia Wire and Cable Co.**, Ansonia, Conn., serving as Chairman.

S. P. Lamberton, Research Supervisor, **General Cable Corp.**, presented a paper prepared by **G. S. Eager, Jr.**, Assistant Director of Research, and Mr. Lamberton, entitled, "Mineral Insulated Metallic Sheathed Cables." [Applause]

DISCUSSION

Question: Can aluminum sheet and conductors be used in place of copper sheet and copper conductors?

Answer: It probably could. Some small amount of work has been done in making up aluminum M. I. cable, but not too much. For one thing, they know how to handle copper a lot better than they do aluminum. For another thing copper in general has much better corrosion resistance than aluminum. I believe in England they use quite a bit of aluminum in this type of cable but at least until now there hasn't been the need to go to aluminum here. Its drawing properties would be different and new problems would no doubt come up.

Question: Has M. I. cable been listed by Underwriter's Lab for hazardous location and would you recommend wire and cable with mineral insulation in installations of sulphuric dioxide and chlorine areas?

Answer: As far as the first question is concerned, whether or not it is suitable for hazardous location depends entirely upon the nature of the seal. The present seal is not approved for use in hazardous locations but we have under study now by Underwriter's a new end seal compound which we expect will be satisfactory and we hope will get Underwriter's approval for use in hazardous locations.

As far as using the cable in environments of sulphuric dioxide and chlorine, if those materials would cause serious corrosion to copper, then the cable should not be used without protective covering. Generally, when the question of corrosion comes up, if copper of any sort is affected in the particular location where it is being considered for installation, then certainly it will affect this sheet as well. Sometimes it can be protected by certain corrosion resisting asphaltic base paints and if necessary other wrapped covering can be applied to the cable. Sometimes a neoprene covering has been extruded over the cable but this adds quite a bit to the cost.

Incidentally, as far as cost goes in general the M. I. would cost a little more than conventional methods. However, taking the installation into consideration, I believe it would be cheaper than an installation of rigid conduit or pipe.

R. H. Publow, Chief Chemist, **Essex Wire Corp.**, Detroit, Mich. presented a prepared paper entitled, "The Trend Toward Vinyl Insulation in Automotive Wiring Systems." [Applause]

DISCUSSION

Question: Can the abrasion resistance of vinyl insulation be improved by the use of finer sized fillers?

Answer: That's a problem in which there is a great deal of study going on right at the moment. Of course S.A.E. abrasion tests are the heat buildup type. One thing the use of fillers does have a tendency to do is to reduce the effect of heat buildup and to slow down that effect. The proper amount of filler can well aid abrasion tests. But it is not going to take a very large amount of filler. In other words, you don't get the reinforcement that we normally expect out of rubber stock. In general filled stocks show poorer abrasion qualities, but there is a point where degradation of the resin properties are overshadowed by the heat effect on an abrasion test.

Question: What is the prime purpose for inclusion of a wax or oil lubricant in the semi-rigid PVC. compound?

Answer: Well, perhaps someone else will have some other thoughts on the subject, but as far as I am concerned the only purpose is to facilitate extrusion.

Question: Is the sandpaper in the scraper abrasion test reuseable?

Answer: Yes, provided you don't ever run a sample over the same spot twice. In other words the sandpaper is perhaps an inch wide and if you start over at one end and have your abrasion test run there and then move a little closer to the center you can get about five or six tests on one single tape.

Question: Could you advise us of the S.A.E. status of this type of wiring cable; and secondly, would you like to say on what automobiles, to give an idea of the current degree of acceptance, this type of wiring cable is presently being applied and contemplated to be standardized in the nineteen fifty-six production?

Answer: S.A.E. does have a specification now which covers automotive low tension wire of this type insulated with semi-rigid vinyl. They have a complete spec on it.

As far as the manufacturers who use this sort of thing, I don't believe there are any manufacturers who don't use it somewhere. Certainly almost the complete General Motors line uses vinyl installations as well as Ford, Lincoln and Mercury. I think that today Chrysler is about the only large holdout to the old braided patterns, but they have quite a few plastic insulated harnesses, too, but seem to be more reluctant to accept it than the other large manufacturers. I don't think there are any manufacturers at all who don't use some of it.

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John A. Fitch, Chief, Industrial Equipment Div., Signal Corps, Philadelphia, presented a prepared paper entitled "Maintenance and Repair of Signal Corps Wire Manufacturing Equipment." [Applause]

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R. K. Larson, Systems Engineer Section, General Electric Company, Schenectady, N Y., presented a prepared paper entitled, "Reel Drive Selection." [Applause]

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A motion picture, "In the Chips" was then shown through the courtesy of **Chase Brass and Copper Co.**, Waterbury, Conn.

The session was adjourned.

NON-FERROUS SECTION WEDNESDAY MORNING

November 16, 1955

The meeting convened at nine o'clock, A.M., with **Andrew Pudlak**, Field Engineer of Copperweld Steel Company, Glassport, Pa., as Chairman.

Chairman: The first paper this morning was prepared by Dr. F. A. Lowenheim, Supervisor, Electrochemical Research, and R. T. Gore, Technical Service Engineer, Metal and Thermit Corp., Rahway, N. J.

Dr. Lowenheim then presented the paper on "Tin-Zinc Alloy Plating—Its Application to Copper Wire." [Applause]

DISCUSSION

Question: Can this plating procedure be used on drawn copper rod prior to cold rolling and still give satisfactory coat after rolling?

Answer: I can't personally answer that from experience, because we haven't done it, but as I say, the properties of tin-zinc so far as ductility and drawability are concerned, are near enough to those of tin so that I would think the answer would be yes.

Do you want to add anything to that, Bob?

Mr. Gore: Just that the tin-zinc coating on copper wire drew satisfactorily and if that could give any indication as to whether it could stand the rolling operation, then you would have the answer, but as Dr. Lowenheim has said, we have not subjected it to that particular test.

Question: What are the maximum speeds obtainable with reasonable sized equipment?

Answer: That, of course, depends on how much is drawn and also what your definition is of "reasonable size." We indicate current densities of about 2500 amperes per square foot, and I think you could calculate from that—and I believe the next paper is going to have something to say about how you can do that—you can calculate from that what speed you can get from a given piece of equipment. We indicated speeds of 300 feet a minute for 36 millionths in a ten-foot tank. If you want to make it a 20-foot tank, you can double the speed, and so on.

Question: What effect does strand annealing have on this coat? Will the coat alloy with the surface and still give protection or disappear?

Answer: Again I can't answer that from personal experience but I wouldn't even want to guess. Actually tin alloys with copper, as with zinc and tin, have been successfully subjected to this procedure without disappearing. You get some alloying but not enough to destroy the value of the coating. I don't think tin-zinc would be too difficult.

Question: Is this process adaptable to heavy coating and subsequent redraw?

Answer: I would say yes.

Question: Is the transformation to allotropic tin a reversible one? That is, will heat or other medium change it back to the commonly known form?

Answer: Yes, the only trouble is that while it will be thermodynamically, it will now—if you heat gray tin and bring it up above the transformation point and make it white tin, it is white tin, but it isn't in the same mechanical form it was before.

In other words, that pile of powder I had on the panel isn't going to jump back to the plate again. It will just be a pile of powder, even though it will be white tin, so the transformation is reversible and you can do it as many times as you want, but the mechanical form of the tin will change.

Incidentally, some Canadian workers have found that the oftener you transform tin the quicker it goes on. Why this should be I haven't the slighest idea —it doesn't make sense thermodynamically.

Question: Have you determined the effect of contamination of hot soldering baths due to the zinc in the tin-zinc coated wire being soldered?

Answer: We haven't, but none of our customers, of whom we have considerable in the electronic industry, has ever experienced any difficulty from this source. I think I can answer that from a practical standpoint—nobody has run into trouble from the zinc and the tin-zinc dissolving in the solder.

Question: Is the resulting coating more or less resistant to abrasion than plated pure tin coating?

Answer: I would say it would be somewhat more. Both plate and tin-zinc are soft, but tin is softer and from that standpoint I would think tin would be somewhat more abrasion-resistant, though neither one of them would be considered a particularly abrasion-resistant coating.

Mr. Pudlak: Any more questions from the floor? If not, I wish to thank Dr. Lowenheim for his paper. [Applause]

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Along the plating line, we certainly appreciate having somebody come all the way from England to tell us how they do it and what they do in the plating business. Dr. Ashton is presenting a paper on the "Basic Principles of Continuous Wire Plating."

Dr. A. B. Ashton, Research Manager, Frederick Smith & Co. Ltd., Manchester, Eng., gave his paper on "Basic Principles of Continuous Wire Plating." [Applause]

Dr. Ashton: I would like to take a personal liberty and say I have been running around this continent for the last seven weeks or so. I have visited a very large number of wire plants and I want to say that I have been received everywhere with the greatest courtesy, the greatest frankness and the greatest wish to be cooperative and helpful. I appreciate that very much indeed.

As my own gesture to international understanding, can I tell you a story? It is a story of an American whose grown-up son was about to visit Great Britain for the first time, and he was receiving from his father some sage advice, and he said, "Don't forget, son, in Great Britain you will find four different races. They are all different. They behave differently.

"You have the Scots. Now the Scots keep the Sabbath very carefully — and anything else they can lay their hands on. (Laughter)

"Now the Welsh. The Welsh pray at church on Sunday —and on everybody else for the rest of the week. (Laughter)

"You have the Irish—and the Irish don't know what they want—but they will fight anybody to get it. (Laughter)

"And you have the English. Now the Englishman will tell you that he is a self-made man and he worships his creator." (Laughter and applause)

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Mr. Pudlak: We are fairly well represented by people who have been trained in other countries besides this country. The next man on our program is author of the paper on "Wire Die Shape and Finish; Some Recent Developments in Production and Inspection."

E. J. Schneider is a native of Vienna, Austria, and graduate of its universitv. He has been vice president of **Engis Equipment Company** since 1939 and a managing director of **Engis. Ltd.** since 1948. Through steady contacts in American and English metal working industries, Mr. Schneider has developed substantial experience in die finishing tools and methods, particularly in the use of diamond compounds and die finish inspection devices of English and German design.

I am sure you will be very much interested in this paper so we will put Mr. Schneider on next.

E. J. Schneider then read his prepared paper. [Applause]

DISCUSSION

Mr. Pudlak: I am sure there ought to be some questions on this paper. Are there questions from the floor?

Question: I would like to ask how fine a wire will the last instrument you showed there—how fine can you mesh it at Engis?

Answer: The company who designed that is, I believe, engaged in working with the filament wire industry with one of the German concerns. From there I feel it should certainly cover the normal filament range.

Question: Would you or Dr. Ashton elaborate on the work where you couldn't come to any specific standards on diamond size?

Answer: Is it imposing upon you, Dr. Ashton, to tell the audience about the work of your committee?

Dr. Ashton: We have in Great Britain the British Diamond Die Federation, which is comprised of all people who are interested in the making of diamond dies, the using of diamond dies, the supplying of diamonds for the making of diamond dies, and that federation has a technical committee which tries very manfully to deal with matters of coordination between those three lines of activity, and endeavors to prepare standards for publication by the British Standards Institution.

It is a heart-breaking job because diamonds persistently refuse to be dealt with in a scientific manner. (Laughter) Why, heaven only knows! We have been trying to find out why—something about these idiosyncrasies.

There are no common denominators. There are no rules. Every die is one perfectly individual bunch of idiosyncrasies.

We have been carrying on a program of investigation for years now with one set of diamond dies that have been subjected to every kind of examination we can think of. They have been put into machines and run and they are very close to similar conditions. Masses of statistical data have been accumulated. We have tried to analyze this data and get a coherent story out of it and it just isn't there. That sounds like a report of despair, I suppose, but we are still hoping, and that work is going on, but I don't know how you will feel about it, but a diamond die is one of the most unpredictable things that we have to play with.

Mr. Pudlak: Any more questions? I guess that is probably why the girls like diamonds. They are unpredictable too. Thank you, Mr. Schneider.

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We will keep moving along on the die field. Mr. Glen is next on the program. He was born in Ottawa, Canada, in 1907. He joined the Cleveland Wire Works in 1928 as a service engineer, a position he held until 1934, when he was made a die salesman. As a member of the Carboloy organization, he continued to specialize in die sales, and in 1941 was moved to the Carboloy general offices in Detroit, becoming manager of die sales in 1944. Mr. Glen is the author of many technical articles dealing with drawing and blanking dies.

A. Earle Glen, Manager — Die Sales, Carboloy Dept. of G. E., Detroit, Mich., read his prepared paper on "Chrome Carbides for Hot Extrusion of Brass and Copper." [Applause]

DISCUSSION

Question: May we have the last slide on again? I would like to ask you a question about it. When you put your nib in your case, do you actually seat the nib on the bottom?

Answer: Yes, sir, we bring it down to bottom. Would you care to add any more to that, John?

Comment: No, excepting that we generally find it is easier and better to assemble with the taper than the straight.

Question: How much advantage do you have on the steel case compared with the die nib?

Answer: In this case, we had 8 thousandths on a two-inch diameter nib.

Comment: I would say 4 thousandths of an inch is a good rule on that.

Question: Coming back to the seating business, do you find you might lose your maximum support in your steel case if the nib actually bottoms?

Answer: We haven't found that to be so as yet and it is a point about which we have thought a lot, but to date seating at the bottom seems to help and it gives support to the back of the nib. As I mentioned earlier, the two important points on this chrome carbide are the

(*Please turn to page* 77)

Maintenance and Repair of Signal Corps Wire Manufacturing Equipment

by John A. Fitch
Chief, Industrial Equipment Division
Industrial Mobilization Activity
Signal Corps Supply Agency
Department of the Army
Philadelphia, Penna.

The part of the program assigned to the subject on which I will talk today is a difficult one indeed to condense into a brief presentation because the background for the program begins with World War II and has never been dormant since that time, but rather has always been active in some respect. The Korean emergency required increased emphasis for accelerated procurement, installation, full use and later a dismantling and lay-away storage program. I propose to present only enough background to give you some knowledge of the past and then in the remaining time to tell you something of the stewardship which Signal Corps has given to the funds which were entrusted to it for the creation of an Industrial Equipment Reserve to be promptly available to industry in time of military need.

Equipment

The 80th Congress passed appropriation bills which made possible the purchasing and installation of large quantities of production and standardized test equipment for the prosecution of the Korean War effort. Such funds were identified as Expediting Production Funds. This same Congress also set up the legislation under which industry who served the military could expand their buildings, utilities and common facilities for increased manufacturing capacity under the Certificate of Necessity Procedure, which provided for more rapid amortization of contractor-owned facilities than ordinarily authorized by the Internal Revenue Service.

John A. Fitch

The author was connected with the Rome Wire Company between 1922 and 1925. Subsequently he had several years of association with Revere Copper and Brass Co., Niagara Mohawk Power Corp., and others, besides a tour of duty with the U.S. Naval Reserve in 1940 and 1941. In 1942 he was appointed Chief, Radio and Radar Branch, Production Division, Procurement and Distribution Service, Office of the Chief Signal Officer in Washington. From 1945 to 1949, he served as Sales Office Manager for The Davison Chemical Co., in Baltimore. In 1949, he joined the Signal Corps, where he is presently employed as above noted.

This paper was delivered at the Annual Convention of The Wire Association in Chicago, Ill., on November 15, 1955.

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Signal Corps is only one of the services which make up the Department of the Army. Ordnance, Quartermaster Corps, and other services are guided by and must follow the policies of the Secretary of the Army and the Deputy for Logistics (G-4) from which emanate uniform policies and procedures for expenditure of monies.

The Korean Procurement program produced many problems of plant expansion. Military items such as CX1065 Spiral 4 Cable, WD-1 TT Field Wire, and other kindred communications items showed industry production capacity deficiencies. Individual Plant expansion projects were prepared and transmitted to higher authority for approval. Procurement Directives with sufficient expediting Production Funds (EPF) were then issued to the Signal Corps Supply Agency directing the placement of Facility Contracts with selected contractors.

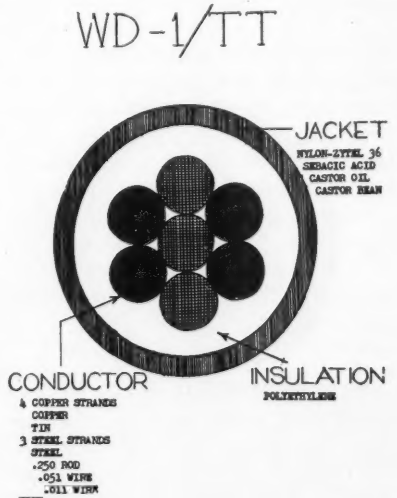

Fig. 1—Conductor construction details, WD-1/TT Field Wire. (Courtesy of Signal Corps Supply Agency.)

These contractors were authorized to procure for the account of the Government the necessary amounts of standard production machinery and test equipment to meet a required monthly produc-

tion rate of specific military products.

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In the Spiral 4 Cable Program, it was necessary for Signal Corps to invest nearly six million dollars to meet its objectives. In the associated field of .015 inch stainless steel wire for braid, the investment of approximately six million dollars was also made. Supplemental equipment was placed in 14 plants on Facility Contracts to support the program of manufacture of this new Spiral 4, multichannel, communications cable. An investment of approximately 6 million was also necessary in the Field Wire Program.

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Among the attendees at this wire conference are many representatives of either the ferrous or non ferrous segments of the wire industry of America. Some of you are familiar with the operation of the Government-industry program for mobilization purposes. Some of you will also remember that Government participation with the wire industry is not a recent development, since during World War II Signal Corps sponsored an extensive program of W-110B Field Wire manufacture which utilized tremendous quantities of steel and copper fine wire in its construction. At the close of World War II Signal Corps took over from Defense Plant Corporations and stored in ther own Depots approximately three hundred (300) seven (7) Wire Stranding Machines, some twinners, and a few auxiliary items such as bare wire spoolers, etc.

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At the beginning of the Korean emergency, this nucleus of Government-owned equipment was distributed according to a prior plan to selected contractors. These items together with those which the contractors procured for the account of the Government and those directly purchased and furnished by the Government collectively provided sufficient equipment. Industry was able during the Korean Emergency to produce greater quantities of Field Wire than ever before.

It was also possible to simultaneously manufacture large quantities of a Spiral Four, which is complex four conductor shielded all plastic construction cable used for long haul communications. This cable utilizes radio frequency carrier current instead of simple D. C. talking circuits. Such a cable and its associated terminal equipment makes possible a dozen simultaneous communications channels for voice, telegraph, teletype, facsimile, etc.

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The military program for manufacture of wire and cable needed during the Korean emergency has now naturally been reduced and gradually companies no longer have need for the Government-Owned Facilities. Since in the copper wire industry no leasing of the Government-Owned Facilities is authorized, it becomes necessary to shut down the equipment and give consideration to its preservation against the day when mobilization may again be necessary.

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Three possibilities present themselves as follows:

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a. Whenever a contractor can accommodate and retain the Government-Owned equipment in stand by condition "in place", it is disconnected from utilities, thoroughly cleaned with air and solvents, long life preservatives are applied, it is shrouded and stored within a protective fence (to prevent cannibalism) under proper conditions of heat, light, moisture control and watchman service. A storage agreement is negotiated with the holding contractor to reimburse him for his costs of such service. Since the purpose of these agreements is mobilization preparedness, no provision for cancellation by the contractor is included. In most cases they provide for an option by the Government to extend the storage term from year to year for a specified number of years, and for prompt reactivation of the Facilities by the contractor in the event of mobilization.

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b. Where manufacturing floor space is at a premium, the holding contractor may offer a proposal to store the equipment in less costly areas at or near to the site of operations in packaged storage. Usually a warehouse type building or one of the older manufacturing buildings is satisfactory, provided that those services of heat, corrosion control, watchman service, etc., can be made a part of the storage agreement.

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The acceptance of such a proposal, of course, calls for dismantling the equipment and parts of the installation, the removal of the equipment from the production line, skidding for handling, commercial wrapping and perhaps crating for protection and in some instances extensive preservation of certain items for long-time storage.

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Non-severable parts of the installation such as sewer lines, water mains, gas and power feeders are left in place in so far as it is possible so long as they do not interfere with the plans of the holding contractor for future use of the released space.

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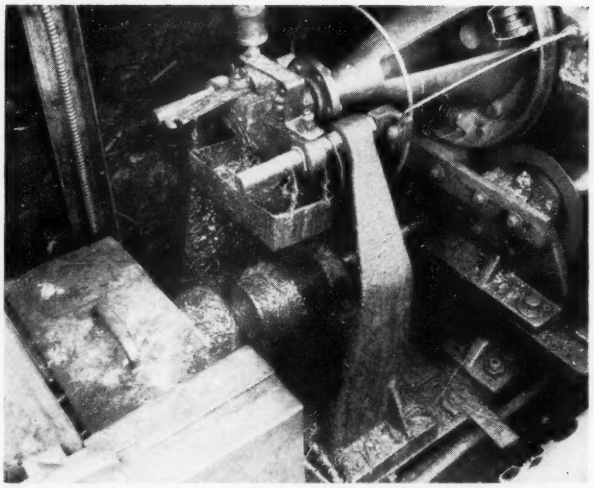
c. In the event that the installation was in the plant of a subcontractor or if the installation in the plant of the holding contractor cannot be accommodated for storage either in place or on site nearby, then a program of removal must be initiated. Existing facilities contracts are modified to encompass conditions of removal and a cost plus a fixed fee or a fixed price contractual action is consummated. It provides for dismantling, commercial-type packing, packaging, including skidding and crating, to meet the Common Carrier Regulations and loading on to motor truck or rail cars. Shipment is then made to the plant of rehabilitation contractors on Government Bills of Lading. After rehabilitation and preservation and packing for storage, the equipment is shipped to a Signal Corps Depot for long-time storage.



* Fig. 2—Wire Strander before rehabilitation; condition indicates poor maintenance.

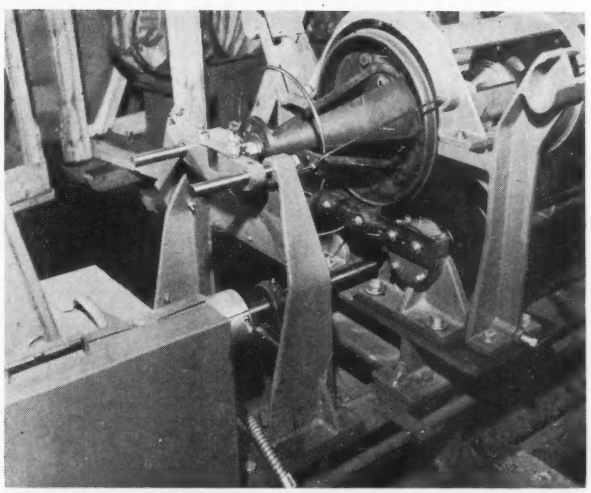


Fig. 3—Wire Strander after rehabilitation; trunion rollers and rings reground, bearings replaced, exposed surfaces painted, plated or preserved.

Signal Corps has two rehabilitation contractors at the present time with an award to a third contractor pending. Work is accomplished in two dispersed locations at Ogden, Utah, and Huntington, West Virginia. Contracts are awarded to technically capable organizations on a cost basis with fixed fee for supervision. Rehabilitation contractors must follow not only good industrial practices but must also adhere to a set of specifications for rehabilitation and preservation for long-time storage especially prepared to cover the list of varied items included in the contract.

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Each rehabilitation contractor is under control of a Work Order Procedure and he prepares a material, labor, overhead and miscellaneous cost estimate of repairs from actual observation through a partial disassembly. A resident industrial specialist passes upon and authorizes repairs on repetitive type items where estimated costs fall within predetermined maximums. On one of a kind items or where estimated costs appear to be excessive, the work order is referred to the Chief of the Industrial Equipment Division to make a decision.

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All items with long procurement lead time that would hold up the installation of a plant are considered for rehabilitation. Many auxiliary items that contribute to the operation of the basic production item must also be rehabilitated and stored. As an example of auxiliary items, we all know that every time copper or steel wire is handled during its manufacture a spool, a reel, or a coil is needed. Therefore spools, shop reels and inter plant shipment reels are part of the stock of the Industrial Equipment Reserve. They too must be protected against the ravages of rust, corrosion by airborne contaminants and physical damage during storage. There are hundreds of thousands of spools and reels for which economical yet fully effective methods of lay-away are being developed at this time.

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Included in the voluminous Industrial Equipment Reserve catalog are items which you will quickly recognize are needed for wire products. Microscopes, die polishers, tensile strength testers, continuous rod, intermediate and fine wire drawing machines, electric or gas fired hydrogen atmosphere annealing furnaces, strander, extruders, coilers, and special mechanical, electrical and electronic test equipment. Specifications for preservation of all such basic items have been compiled by competent Government packaging and storage specialists working in harmony with both original manufacturers and holding contractors.

★ ★ ★

Government-Owned equipment is usually installed to augment the production of contractor-owned equipment. Therefore, since equipment is usually intermingled, proper maintenance would be expected. There have been several instances where contractors obviously gave the preferred treatment to their own equipment. Some Government-Owned equipment shows the effect of substandard maintenance and a minority of the contractors have been told of their deficiencies regarding proper care. Where holding contractor maintenance standards have been lowered, the rehabilitation costs to the Government have, of course, increased.

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The rehabilitation contractor proceeds with complete disassembly of all items of mechanical nature that show signs of extensive use or possibly abuse through lack of maintenance.

★ ★ ★

All non-critical parts such as frames, supports, guards, electrical cabinets, pipes, conduits, etc., are subjected to a hot dip in detergent solution for removal of corrosion, rust, etc., with a subsequent drying, as needed. More critical items such as shafts, bearings, clutches, etc., receive solvent clean up and

(* Figs. 2, 3, 4, 5, 6 supplied through the courtesy of Polan Industries, Inc., Huntington, W. Va.)

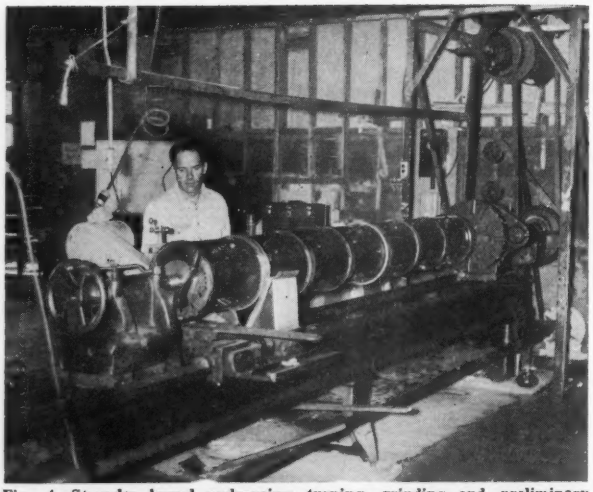

Fig. 4—Strander barrel undergoing turning, grinding and preliminary balancing. * * * * * * * * * * * * *

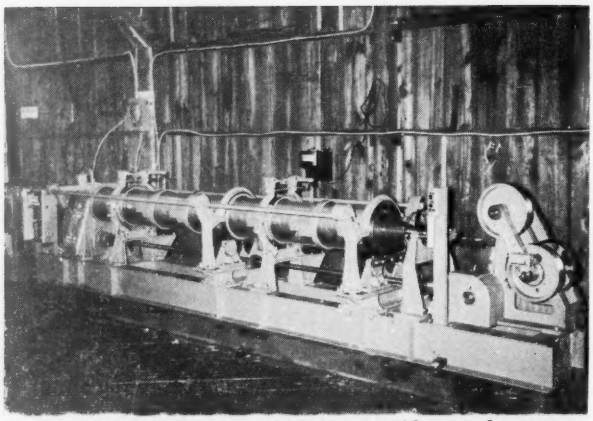

Fig. 5—Rehabilitated Strander at dynamic test position; two hour test under instrumentation of power consumption, speed, vibration, heat rise, etc.

inspection for wear leading to replacement. Critical parts of head stocks on lathes, gear reducers, etc., are solvent cleaned, checked for wear, adjusted, if possible, parts replaced, lubrication replaced with temporary lubricants of preservative type and processed through the usual finish and packaging routine.

★ ★ ★

Electrical control equipment is disassembled, control and solenoid coils baked, dipped in varnish, baked again and assembled with new leads, contacts, springs and overload heaters, as needed.

★ ★ ★

Electric drive motors receive a tear down, solvent clean up, megger test, bake out, varnish dip and bake or spray paint treatment and re-assembly with new brushes, leads, and bearings as needed.

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In the preceding paragraphs an attempt has been made to tell you as briefly as possible some of the highlights of the continuing rehabilitation program. It is designed to provide adequate Government-Owned stocks for shipment (without excessive delays)

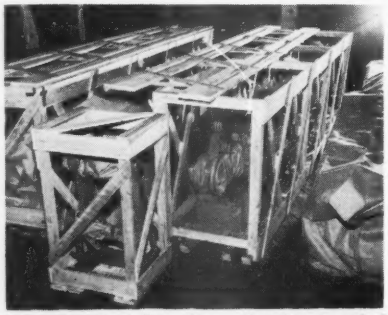

Fig. 6—Completed Strander, packaged and packed with matching take-up reel unit prior to shipment to Signal Corps Storage Depot. * * *

to the wire and cable industry, thus making possible a procurement program for large quantities of wire and cable in times of mobilization.

★ ★ ★

Even though the Korean emergency has passed, a procurement of wire making machinery is currently under way to replace either obsolete and inefficient equipment or to add to the Industrial Equipment Reserve so that sufficient equipment in the proper quantities for each manufacturing process will be on hand when needed.

★ ★ ★

A comprehensive Central Inventory record of each item of production equipment stored in reserve is maintained at the Signal Corps Supply Agency. This record shows a technical description, operating characteristics, condition, present location, and other pertinent information regarding each item. The inventory is maintained in such a way that it is possible to determine readily what types of equipment are available and in what quantities, and where it is located. This inventory, together with plans for redistribution of equipment worked out with planned suppliers, will facilitate rapid activation of reserves in the event of mobilization.

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The cooperation which the wire and cable industry has given throughout the years to the Signal Corps in the continued planning for "M" Day is very much appreciated. Their most recent efforts of expanding plants and their production during the Korean Emergency merit our hearty approval.

★ ★ ★

It is Signal Corps' responsibility to be ready with the tools for manufacturers so that again a smoothly operating military-industry team will be available to support mobilization.

1956 MEETINGS OF THE WIRE ASSOCIATION

May 26 & 27: Kansas City, Mo., Hotel Muehlebach. Midwest Regional Meeting.
June (date to be announced) at San Francisco, Calif. Pacific Coast Regional Meeting.
Oct. 29 - Nov. 1: Pittsburgh, Pa., Hotel William Penn. The Annual Convention.

Watch for detailed announcements

THE WIRE ASSOCIATION

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SINCE 1843 INCORPORATED 1901

Electronic Measurement of Hot Rolled Wire Rod

by Charles D. Gibbs
Sales Manager
Industrial Gauges Corporation
Englewood, New Jersey

During the last five years, as Sales Manager of his company, the author has worked with a number of wire mills on the non-contact method of controlling and measuring of steel, copper and aluminum wire in gauging for out-of-roundness. Recently the company developed equipment for the gauging of hot rolled rod. This paper describes this new tool for rod mill control and its place in automation.

The paper was delivered before the Annual Convention of The Wire Association in Chicago on November 15, 1955.

This paper will serve to acquaint rod and wire mill managements with a new device in the field of electronic control equipment for your industry. At the same time it will give you an insight into some of the problems involved in the development of this type of equipment. While our company has been associated with the steel rolling and insulated wire industries for some years, it has only been recently that our attention was brought to bear on a significant aspect of your product in the case of the rolling mill operator, or your raw material in the case of the wire mill operator.

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We propose to discuss a common problem—wire rod dimension, its development, its effect on further processing and a plan for improvement. To introduce the subject, let us review the rod rolling phenomena.

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Wire rod is produced from a square bar or billet commonly either 4 x 4 or 1¾ x 1¾ inches. After being heated to 1,600 to 1,800 degrees Fahrenheit it is reduced to a roughly round rod by a series of rolling operations—the finished size determining the number of passes. (See Fig. 1.) The square bar is flattened to an oval or diamond shape in the first stand, rotated 90 degrees, rolled to a square again in the second stand and then alternately rolled to oval and square shapes in successive stands. This alternate square and oval rolling is repeated until the material is reduced to the proper cross section area. In the final pass the oval rod, having been rotated onto its edge, is rolled to a round shape. The finished rod is coiled and cooled and then routed for further processing or trimmed, banded and stored.

★ ★ ★

The shape of the finished product is thus the result of a series of alternate flattening and squaring operations. The dimensional uniformity of the finished rod is affected by a wide variety of influences. Chief among these are the temperature of the bar before its entry into the mill; the uniformity of this temperature throughout the length of the bar; the spacing between rolls, especially in the first and last stands; the tension between stands; the proper adjustment of the guides and the lateral alignment of the rolls. A wide variety of subordinate factors contribute still further to the dimensions of the finished product. It might not be out of place to note at this point that all of us associated with the development and application of our equipment to this process marvel that any wire rod is produced, let alone a good rod.

★ ★ ★

The finished product must be drawn down to size. The cost of this drawing operation, measured in terms of worn and broken dies, is intimately related to the quality of the rod. Wide variations in diameter, lean rod, over-fill or squash-outs all complicate the drawing operation and rod producers have long sought a means of avoiding these defects for simple economic reasons.

★ ★ ★

In the first phase of development of automatic control equipment for rod mills, our company has been concerned with the dimensional or shape aspect of the rod, making no note of its ap-

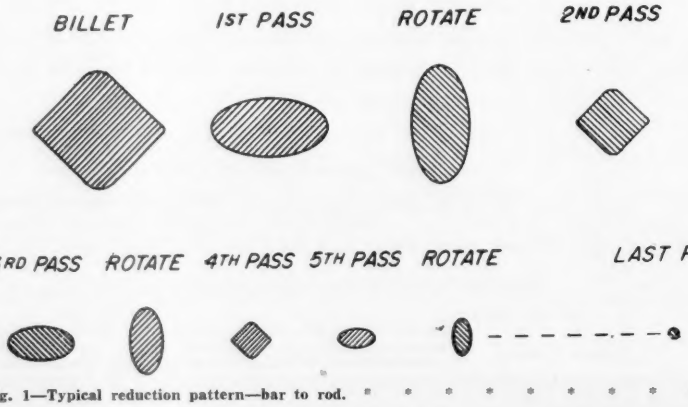

Fig. 1—Typical reduction pattern—bar to rod.

pearance, physical qualities or chemical composition, these being more readily measured and controlled. The problem given us was the development of a satisfactory device for measurement of rod dimension in either one or two of its principal planes. Because of the numerous inter-related factors which contribute to the final dimension it was decided that automatic adjustment of roll pressure and interstand tension must be deferred pending the accumulation of more detailed information on the rolling phenomena.

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Measurement of hot rolled rod at 1600 to 1800 degrees Fahrenheit, travelling up to 5,000 feet a minute, vibrating in several planes and surrounded with an atmosphere of steam, scale and oxide dust is not convenient. Measurement should be continuous and at the first possible point following completion of the rolling, preferably at the exit side of the last stand of the finishing train. Contact type gauges can not even be considered because of these conditions. Indirect gauging through capacitance or inductance is also not feasible for the same reasons. Optical gauging is fraught with many problems: radiation from the rod spans the infra-red spectrum and encompasses some of the visible spectrum, making use of the more conventional regulated light source and photoelectric detectors, that is, the measurement of variations in intensity, impossible. Added to this, the presence of scale, oxide dust, steam and water, as well as the marked vibration of the rod make the selection of an adequate measuring system difficult. An accuracy of 3 mils or better was considered necessary in view of the 15 mil tolerance presently allowed the manufacturer. Stability, ease of operation and simplicity of maintenance were also required.

★ ★ ★

These general requirements provide the specifications of the ideal gauge. Performance-wise it must cover the range of rod mill outputs from a number 5 to ⅜ inch rod, it must measure and display variations in dimension in increments of 3 mils or less. It must operate over a wide range of temperatures. It must be insensitive to vibration and whip of the rod in both vertical and horizontal planes. It must be insensitive to reasonable amounts of scale, oxide dust, steam and water. Construction-wise it must be based on a rugged circuit capable of withstanding severe mill service. It must be mounted far enough from the pass line to avoid damage by cobbles. It must be constructed with premium components to insure minimum maintenance and must provide ready access to all parts when maintenance is required. Operation-wise it must be simple to set up and must have several direct reading, wide scale deviation indicator stations. In use, the gauge should ideally measure both the vertical and horizontal dimension since by the very nature of its production the rod is not perfectly round.

★ ★ ★

With the foregoing specifications as a goal a gauge was developed. This equipment borrowed heavily from the design of our widely used hot strip width gauge. It was necessary to make extensive modifications to achieve the accuracy and meet the mounting distance requirements of rod mill service. In principle, the gauge scans across the moving rod by means of a lens-rotating prism—slit aperture photocell system. The photocell used has a peak sensitivity to infra-red radiation and as you probably know from your experiences with sunburn on a cloudy day at the beach, infra-red radiation is not markedly modulated by the presence of clouds or other small particle atmospheres. The infra-red image of the glowing rod is "swept" across the slit on the phototube by the rotating prism. A pulsating signal having a duration proportional to the width of the rod is thus produced. This is compared with a standard signal which is varied by means of a dial calibrated directly in thousandths of an inch. Variations between the two signals are displayed on a zero center meter as deviations from the preset nominal. This system met every requirement for ease of setup and accuracy and mill tests showed it to exceed our expectations for speed and fidelity of deviation indications.

★ ★ ★

The completed equipment consists of a gaugehead and measuring console for each axis of the rod to be measured. (See Fig. 2.) The gaugehead is mounted above or to the side of the exit side of the last stand of the rolling mill, view-

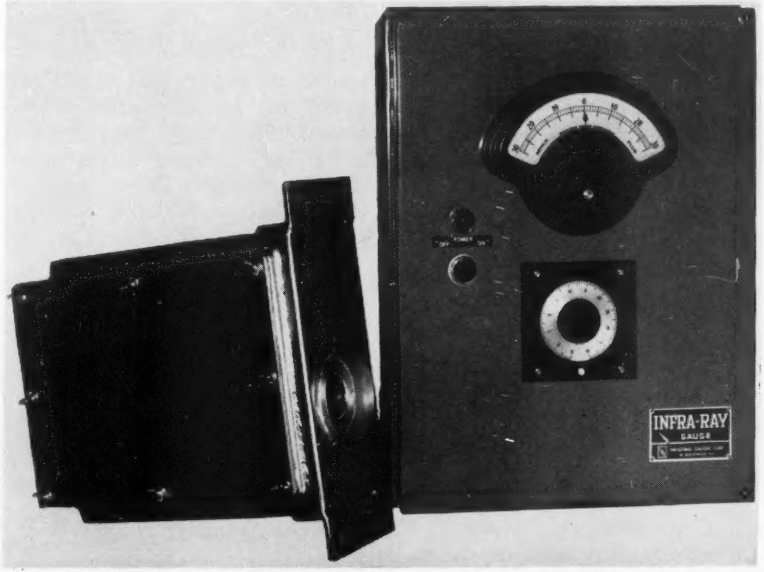

Fig. 2—Gaugehead and measuring console.

ing an area of about 2 inches between the exit of the mill and the guide tube to the coiler. The measuring console is located at any convenient point in the area, generally at the finishing train operator's control station. Auxiliary indicator meter stations are located at the roughing mill and coiler to provide those operators with the necessary intelligence for roll adjustment and trimming.

★ ★ ★

Early in the planning stage it was recognized that some compromise must be made to the degree of gauging which would be acceptable. While measurement of only part of the output, or sampling, of any process is sometimes undesirable, it is justified where the sample available is representative of the output and where 100% inspection adds to the expense of the installation out of proportion to the benefits derived. Both conditions hold in the case of the rod mill. First, it has been proved and accepted that at any given moment all strands are essentially uniform in dimension characteristics with the central strands being larger by a predictable degree due to spring of the rolls. Second, measurement on the horizontal axis of the inner strands is difficult to the extent that it is sacrificed to economy.

★ ★ ★

The practical gauge installation will therefore consist of one or two gaugeheads mounted above the pass line on an indexed rail and one or two gaugeheads mounted horizontal to the pass line on either side of the mill. The vertically mounted heads will "see" the horizontal dimension of the strand at any of the several passes. The horizontally mounted heads will "see" the vertical dimension of the outer strand or strands. Suitable shields must be located between the outer and inner sets of pass lines to prevent confusing the gauges with a second signal from a strand coming out of one of the inner passes. (See Fig. 3.)

★ ★ ★

In service the breakdown mill roller observes his indicators for the gauges on the vertical axis of the rod to aid in adjusting his rolls from time to time to control the amount of metal leaving his mill as this mill governs the horizontal dimension of the finished rod. The finishing mill operator adjusts his rolls on the information displayed on the horizontal axis indicators to control the vertical dimension of the rod. In normal operation these men working in unison can set up the mill and bring the rod to dimension with a minimum of waste and thereafter hold it well within tolerances.

★ ★ ★

Experience with production installations has not been sufficient to establish detailed performance data or the degree of improvement of quality and quantity of production which can be achieved with the addition of the gauges. However, a number of tests were made in mills during the course of development. These showed: First, the gauge indicated faithfully the variations in dimensions. Evidence of this was that the indicators showed all those variants with which the operators are familiar; for example, the sudden change of a few thousandths in the dimension of the strands remaining in the mill after one strand leaves the rolls and before a new strand replaces it; the classic pattern of dimensional changes in the front and back end of each strand due to the reduction of tension as the strand is stretched between fewer stands on entry and exit. Second, variations indicated and absolute dimensions shown on the meters were checked repeatedly and found to be accurate. Third, when bad rod could be predicted because of a disturbance of production equilibrium, the gauge showed clearly just how bad the rod was. For example, when a cobble occurred, the succeeding rod showed the effect of the hold-back. Fourth, the accuracy was unaffected by the temperature of rod, by its movement in all directions to the extent of as much as ⅜ inch, by the vibration of the gaugehead mounting or by steam spray and oxide clouds.

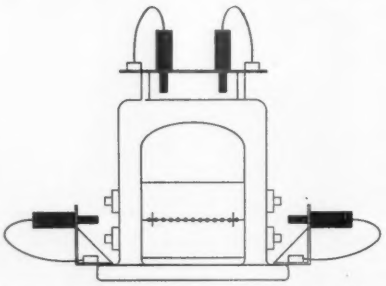

Fig. 3—Arrangement of gaugeheads on the finishing mill.

★ ★ ★

That the gauge can contribute materially to a better product is self-evident. It opens up a whole new field of engineering of rolling mill and drive designs to the end of reducing that shrinkage now experienced at the front and back ends of each coil as well as providing a tool for improved operation of rolling mills.

★ ★ ★

Final specifications based on actual performance bettered design specifications in every respect. First, the gauge covers the range of .180 to .380 inches. Second, accuracy is retained across the conservative working range of 1200 to 1800 degrees Fahrenheit. Third, accuracy is not affected by the presence of normal amounts of oxide dust, scale or steam. Fourth, the deviation indicator scale of plus and minus 30 mils in increments of 1 mil is sufficiently broad to give operators the necessary intelligence for setting up the mill yet is calibrated in sufficiently fine increments to permit precision work. Fifth, accuracy over the range of temperatures and atmospheric conditions specified is within one mil. Sixth, response is essentially instantaneous. It has been found in practice that some damping of the indicator is desirable to reduce operator fatigue. Provisions for damping are therefore incorporated into the circuit. To insure against momentary neckdowns or overfills passing through unobserved, auxiliary signal circuits can be added to "see" out-of-tolerance variations which occur too fast to be displayed on the damped indicator.

(*Please turn to page* 77)

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CABLE LACQUERING
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ANTHONY R. LORENZO, C.P.A.

345 MADISON AVENUE
NEW YORK 17, N.Y.
MURRAY HILL 6-2323

October 26, 1955

The Wire Association
453 Main Street
Stamford, Connecticut

Gentlemen:

We have made an audit and examination of the financial transactions of the Wire Association for the period April 1, 1955 to September 30, 1955 and in connection therewith present our report as follows:

SCHEDULE #1 - Condensed Comparative Statement of Cash Receipts and Disbursements for the fiscal years ended September 30, 1955 and September 30, 1954

SCHEDULE #2 - Statement of Cash Receipts and Disbursements for the period April 1, 1955 to September 30, 1955

SCHEDULE #3 - Schedule of Wire Association Operating Expenses absorbed by Quinn-Brown Publishing Corp. for the period April 1, 1955 to September 30, 1955

Operations of the Association for the fiscal year ended September 30, 1955 resulted in an excess of Cash Receipts over Disbursements in the amount of $3,160.16 as compared with $1,872.31 for the fiscal year ended September 30, 1954 or an increase of $1,287.85.

The Wire Association does not maintain any books or records of accounts as such and all financial transactions of the Association are handled through the accounts of the Quinn-Brown Publishing Corp. In order to ascertain the accuracy of the cash position and the financial transactions of the Wire Association, we made an audit of the books of account of the Quinn-Brown Publishing Corp. All expenses charged to the Association were properly vouchered and correctly charged.

In order to evaluate the services and expenses that were donated to the Association by the Quinn-Brown Publishing Corp. we have prepared and submit herewith as Schedule #3 a statement of expenses directly absorbed by them. There are many other convention and sundry expenses, in addition to time devoted by Mrs. Ruth S. Spengel, Assistant Secretary and Mr. Edmund Sickels, Editor that were also absorbed, and since we were unable to determine any actual values for these we did not include them in this schedule.

As at September 30, 1955 there was on deposit in the Security Bank and Trust Co. of Stamford, Connecticut $5,118.95 in the name of the Wire Association. This balance was reconciled with bank statements and confirmed directly with the depository.

The figures included herein have been obtained from the books and records of the Quinn-Brown Publishing Corporation after audit but without recourse to independent confirmation.

Respectfully submitted,

SAMUEL H. HAIMS & CO.

CAT:rmb

Certified Public Accountants

SCHEDULE #1

THE WIRE ASSOCIATION

Condensed Comparative Statement of Cash Receipts and Disbursements for the Fiscal Years Ended September 30, 1955 and September 30, 1954

	1955	Percent	1954	Percent
CASH RECEIPTS:				
Dues	$16,860.00	76.0	$15,675.00	83.4
Convention and Regional Meetings Net Proceeds	5,332.55	24.0	3,112.62	16.6
Total Income	**$22,192.55**	**100.0**	**$18,787.62**	**100.0**
CASH DISBURSEMENTS:				
Office Salaries	$ 5,460.00	24.6	$ 5,200.00	27.7
Subscriptions to Wire and Wire Products	5,700.00	25.7	5,285.00	28.1
Directories	2,280.00	10.3	2,114.00	11.3
Meetings	1,858.48	8.4	1,119.90	6.0
Postage	1,683.00	7.6	1,341.00	7.1
Stationery and Printing	1,247.04	5.6	1,416.71	7.5
Other Operating Expenses	803.87	3.6	438.70	2.3
Total Disbursements	**$19,032.39**	**85.8**	**$16,915.31**	**90.0**
NET INCOME	**$ 3,160.16**	**14.2**	**$ 1,872.31**	**10.0**

SCHEDULE #2

THE WIRE ASSOCIATION

Statement of Cash Receipts and Disbursements for the Period April 1, 1955 to September 30, 1955

CASH ON HAND—APRIL 1, 1955			$ 3,989.21
CASH RECEIPTS:			
Income from Dues:			
Individual Membership—514 @ $15.00		$7,710.00	
Company Memberships (56 Individuals) 7 @ $100.00		700.00	
Total Income from Dues		**$8,410.00**	
Other Income:			
New York Regional Meeting	$3,322.50		
California Regional Meeting	359.32		
Total Other Income		3,681.82	
Total Cash Receipts			12,091.82
Total Available Funds			$16,081.03
CASH DISBURSEMENTS:			
Office Salaries		$2,860.00	
570 Subscriptions to Wire & Wire Products @ $5.00		2,850.00	
570 Directories @ $2.00		1,140.00	
Advance to Pacific Coast Committee		175.00	
Directors Meeting—New York		217.85	
Wire Association Expense—New York		507.09	
San Francisco Regional Meeting		958.54	
Auditing		150.00	
Badges		116.65	
Association Papers—Engraving Cuts		337.22	
Wire Association Award Medal		50.00	
Postage		870.25	
Stationery and Printing		729.48	
Total Cash Disbursements			10,962.08
Cash in Security Bank and Trust Company Stamford, Conn. — September 30, 1955			$ 5,118.95

Electronic Measurement of Hot Rolled Wire Rod

(*Continued from page* 74)

Automation can be defined as the displacement of routine, onerous, dangerous, menial or trivial labor, both mental and physical. It is but a short word for automatic control. An automatic control consists of three elements — "error sensing", "decision making" and "action effecting". The equipment described in the foregoing is the sensing section of an automatic control. The decision making element is available. The action effecting element can be developed at the appropriate time. This may require some time since historically any new fields opened by development of such a sensing equipment requires some time for digestion by engineering and operating divisions. A complete automatically controlled rod mill is far from impossible, however, for it is a fact that at the moment our company is cooperating with one of the larger steel companies in introducing coordination of multistand cold roll mills. Automatic adjustments of the roll pressures and tensions based upon gauge intelligence produces a remarkable uniform product with a minimum loss of steel due to off-gauge areas, especially accentuated at the front and back ends—almost precisely the same phenomena observed in hot rolled rod operation.

Proceedings Non-Ferrous Discussions

(*Continued from page* 66)

non-oxidizing features and if you noticed on one of those slides, as you increased your temperature, the coefficient of expansion gets closer to that of steel so you can get proper support at the higher temperatures.

Question: You have some rules for cutting—do these also have possible applications in the die field?

Answer: Yes, they do. We are making some up for test right at the moment, as a matter of fact. Possibly at this time next year we will have something further to report.

Question: Do you care to say anything about what you expect these dies to do compared to the tungsten or chrome carbide dies in this?

Answer: Again the tin-zinc oxides do not have very much strength, but we do feel that it will fit into the smaller sizes of copper wire. We feel there is a good chance they will go down lower

SCHEDULE #3

THE WIRE ASSOCIATION

Statement of Operating Expenses
Absorbed by Quinn-Brown Publishing Corp.
For the Period April 1, 1955 to September 30, 1955

EXPENSES:			
Office Salaries		$4,050.00	
Less: Reimbursed by Wire Association		2,860.00	$1,190.00
Payroll Taxes and Insurance Thereon			178.50
Subscriptions to Wire and Wire Products:			
Domestic 523 @ $8.00	$4,184.00		
Foreign 47 @ $10.50	493.50	$4,677.50	
Less: Reimbursed by Wire Association		2,850.00	1,827.50
Directories:			
Subscription Price 570 @ $3.00		$1,710.00	
Less: Reimbursed by Wire Association		1,140.00	570.00
Advertising Space in Wire and Wire Products at minimum rate			1,353.00
Office Rent			1,000.00
Total Expenses Absorbed by Quinn-Brown Publishing Corporation			**$6,119.00**

than .0065, particularly in the copper industry.

Question: In hot extrusion, is die shape used identical to that in steel dies or Stellite inserts?

Answer: I would say yes. Possibly with more experience it may be changed —but actually I think those shapes have been developed over the years and all you are doing is changing the surface condition, and we have followed the previous design used on Stellite dies.

Question: Can it be supplied in various shaped blanks like tungsten carbide?

Answer: Yes, it can. Any shapes you have—or anything you have supplied in the past in tungsten can readily be made in chrome carbide.

Question: Any application in sand blast nozzles?

Answer: As I stated before, chrome carbide does not have the abrasion resistance that tungsten carbide does and it would not be good in that application. Straight tungsten carbide would be much better.

Question: What is the maximum temperature at which chrome carbides can be used continuously?

Answer: I don't know as we can answer that all the way, but we have had a continuous run, as I mentioned, of 200 billets in the extrusion of brass without removing the die from the press.

Question: What die is used for aluminum extrusion and at what temperature?

Answer: We are not doing too much in the aluminum field today. I believe the temperatures — but somebody could correct me on this — on aluminum are around 750° to 790°. Maybe somebody else would care to answer that.

Question: This case of the 200 pushes without changing the die — do you happen to know the alloy billet size and extruding size?

Answer: We have one of our men here from Detroit, one of our engineers. Would you care to answer that?

Answer: No, I couldn't answer that specifically. I don't know the billet size — I believe it was around seven or eight inches.

Mr. Glen: I believe the billet size was about eight inches in diameter, about four inches long.

Question: You say it shows reasonable wear. Do you mean a tenth of a thousandth or three thousandths, or just what are you referring to on that?

Answer: I have seen dies up to the 1500 pushes and they have worn three thousandths. Some of the people that are using them have found it has helped their quality control considerably. They are able to hold the tolerances and to get a much better finish on the extruded rod—less scratches.

Question: How about front-to-back end variation? Is that roughly the same as in steel from the front of the rod to the back of the rod?

Answer: No, I would say it is less. You have practically no variation between the front and the last. If you have one thousandth, that is quite a bit.

Question: Do those nibs crack similar to the original alloy nibs?

Answer: Yes, they do. You get a spider web effect but they do stick together. As a matter of fact, you will see very light marks on it after the second push, but the material stays together.

Mr. Pudlak: Thank you, Mr. Glen. [Applause]

The next thing on our program will be a movie. This is shown through the courtesy of the **Anaconda Wire & Cable Company**, New York City. The picture is "Nerves of the Nation."

. . . The movie was shown . . .

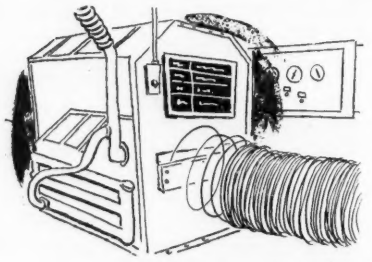
. . . The meeting adjourned at eleven-twenty o'clock. . . .

TO SELL—ADVERTISE IN
WIRE AND WIRE PRODUCTS
It pays—send for rates
453 Main St., Stamford, Conn.

What Lies Ahead

(*Continued from page* 39)

This process starts with annealed stainless coils which are driven through straightening rolls and then formed into a helix about 30″ in diameter. This helix is supported on a long rotating bar. A rubber lined tank, which is divided into several parts, is put under this helix and also supports the rotating bar. As the wire works its way in screwlike fashion across the bar, it is immersed in the subdivided parts of the main tank, such as a pre-cleaning solution, water wash, nickel plating, water wash, and copper coating divisions.



★ ★ ★

Now, let us translate this into use for carbon steel rods. The straightening and helix forming operation acts as a scale breaker. With rods in this condition, only a flash dip in acid is required. So, let us divide the tank into divisions containing acid, water, lime or borax, and a flash baker. After going through this setup, the rod accumulates on the extension of the bar at the exit end. With this placed behind a wire drawing machine, we then will have a completely automatic setup for cleaning, coating, and drawing of rods. This process has the advantage over our present batch processes of assuring that each strand is uniformly clean, coated, and dried. The possibility of having our rods in such condition is like having a dream come true.

★ ★ ★

Following through with our thought of automation, the wire once drawn will not be placed on a truck to be hauled away, weighed, inspected, tested, and packaged. Let us consider that

(*Please turn to page* 119)

Government Wire Production Information

Government Metal Purchases

Quantities bought through September 30, 1955, under the Government's purchase programs for domestic tungsten, manganese, chrome, mica, beryl and asbestos have been announced by **Edmund F. Mansure,** Administrator of General Services.

★ ★ ★

The programs were established to stimulate the search for and the production of strategic and critical materials in the United States. They are separate from the exploration program of the Defense Minerals Exploration Administration, Department of the Interior.

★ ★ ★

Tungsten. Tungsten concentrates under the Government purchase program are accepted at various milling points, mostly in the West. The regulation setting up the tungsten purchase program was published in the Federal Register on May 11, 1951. Purchase of 3,000,000 short ton units (20 pounds each) of contained tungsten has been authorized. Delivered to date: 2,153,101 short ton units.

★ ★ ★

Manganese. Manganese is accepted at three depots—Butte and Philipsburg, Montana; and Deming, New Mexico. Manganese is also accepted in carload lots at any rail point in the country. A depot at Wenden, Arizona has been closed after acquiring its goal. Regulations establishing the Butte, Philipsburg and Deming depots were published July 21, 1951; the Wenden regulation was published July 3, 1952, and the carload regulation on July 9, 1952. The quantities authorized are: 6,000,000 long ton units (22.4 pounds each) of contained manganese for Butte and Philipsburg together; 6,000,000 long ton units for Deming; and 19,000,000 long ton units for the carload program. Delivered to date: Butte and Philipsburg, 1,809,417 units; Deming, 4,459,646 units; carload program 4,493,489 units. Under the authority granted by the Office of Defense Mobilization, purchases of manganese at the depots is now being made on the basis of recoverable, rather than contained units, and reports of receipts are made on that basis.

★ ★ ★

Chrome. Chrome ores and concentrates are accepted at a depot at Grants Pass, Oregon. The program was published August 28, 1951. Purchase of 200,000 long tons of ores and concentrates has been authorized. Delivered to date: 93,985 long tons.

★ ★ ★

Mica. Mica is accepted at three depots—Spruce Pine, North Carolina; Custer, South Dakota, and Franklin, New Hampshire. It is accepted in three forms—block,

MICROMETER PRECISION MICRO-WELD TRADE MARK REGISTERED

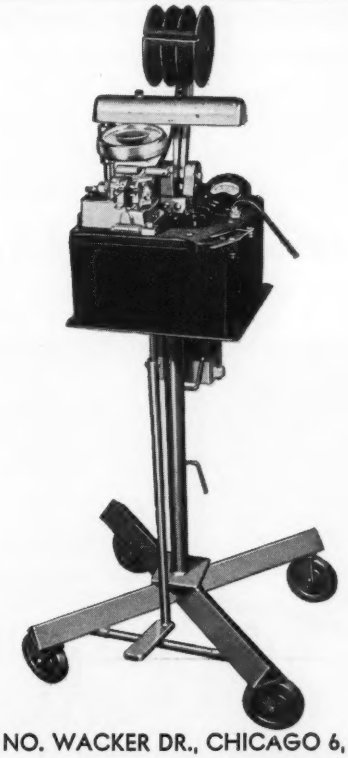
MODEL S.E.M.T. MICRO-WELD BUTT WELDER

This welder was designed and developed expressly for welding all types of fine wire: Aluminum, Copper, Brass, Bronze, Steel and Steel Alloys, ranging in size from .005" to .020" diameter.

Unit design of frame, transformer and power sub-assemblies permit other range of sizes to suit requirements.

Equipped with a temperature indicating annealing and tempering device, voltage regulator and meter to compensate for voltage fluctuation, wire cutters, extra large 5" diameter magnifying glass, fluorescent light and extension cord. Welder can be supplied for bench mounting, or mounted on 4-wheel truck.

The adaptability of this unit for welding all types of wire, either ferrous or non-ferrous, in sizes from .005" to .020" diameter, makes it ideal for the fine wire manufacturer.



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film and hand-cobbed. The program was published March 15, 1952. Purchase of 25,000 short tons of hand-cobbed mica or the equivalent has been authorized. (For purposes of the program, 90 pounds of block or film mica are considered as the equivalent of one ton of hand-cobbed mica.) Delivered to date: 6,999 tons of all types at all depots

★ ★ ★

Asbestos. Nonferrous crysotile asbestos in three grades, Crude Nos. 1, 2 and 3, is accepted at a depot at Globe, Arizona. The program was published December 23, 1952. Purchase of 1,500 short tons of Crude No. 1 and/or No. 2 has been authorized. Crude No. 3, which is accepted on a tie-in basis with the other two grades, is not figured into the quantity authorized. Delivered to date: Crude No. 1 and No. 2, 1,093 short tons; Crude No. 3, 540 short tons. Total, in terms of program, 1,093 tons Crude Nos. 1 and 2.

Wickwire Spencer Improvements Nearing Completion at Buffalo

The new United rod mill at the **Wickwire Spencer Steel Division** of C. F. & I. in Buffalo was started up during the recent Convention in Chicago and has undergone the initial shakedown runs. The new rod mill will produce 600 pound coils—double the old—and is expected to boost the company's wire production considerably.

★ ★ ★

Other phases of the four-million-dollar improvement program at Buffalo are progressing favorably. One of the enlarged open hearth furnaces was also fired in November, one was due for completion in December and a third should be ready in February. Tons per heat are being increased from 110 to 170. There are four open hearths.

★ ★ ★

The welded wire fabric department, down for some time for the installation of new equipment and rearrangement of the layout, was expected to be placed in operation in December.

New All-Aluminum Spools Introduced

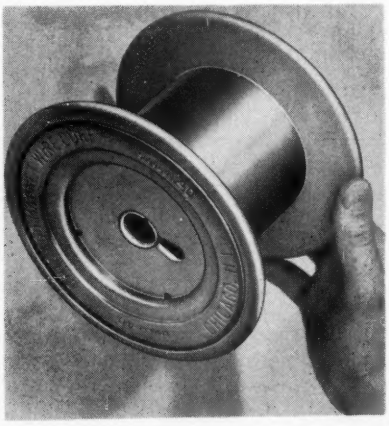
A new light weight line of aluminum alloy wire spools has been announced by **Hubbard Spool Company.**

★ ★ ★

The firm, which custom designs and produces a variety of special and standard spools, states that it's "AA" series possesses exceptionally high strength-to-weight ratios. All-aluminum construction consists of high yield, high impact strength stock for heads and barrel and for the end washers.

★ ★ ★

Special deep drawing alloys facilitate manufacture of the spools



in two halves, the head pieces being integral parts of the barrel. The two halves are jigged and heliarc welded to form the equivalent of a single piece barrel and overall spool. Standard units are available in 5 to 40 pound capacities in various traverses and head diameters. Standard arbor sizes of .632, 3 and 3-1/2 inches are available, although other sizes are produced on special order.

★ ★ ★

Concentricity is held to within .005 inches of the spools' specifications making for vibration free high speed performance, the maker states. Need for after-treatment is eliminated because the basic fabricating methods reduce snag-causing surface irregularities to negligible proportions. The manufacturing technique provides nearly perfect weight uniformity, simplifying bulk weighing.

Basic Materials

FOR A MILLION PRODUCTS

Alloy Wire, Rod and Strip . . .

Design Engineers are taking advantage of the outstanding mechanical and electrical properties and excellent formability of Alloy Wire, Rod and Strip. Results: Better products, smaller and lighter products, products that are more corrosion-resistant, more heat-resistant, more attractive —and more economical.

Alloy Metal Wire Division can supply you with high quality wire, rod and strip in Stainless Steels, Nickel Alloys and Electrical Resistance Alloys. Why not put these versatile materials to work for you?

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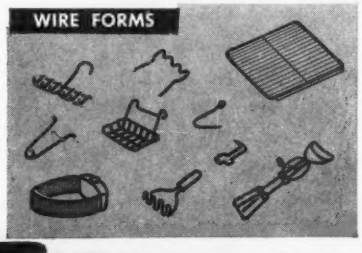

ALLOY METAL WIRE DIVISION

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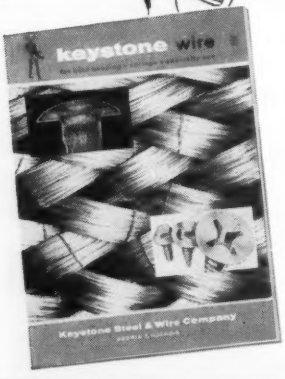
Every metalworking man—engineer, buyer, executive—should read this new booklet presenting many up-to-date facts about the *flowability* of Cold Heading Wire. It contains illustrations, diagrams, and technical facts useful to anyone in the modern, wire fastener industry. See how the most complicated and intricate parts can be cold headed. Mail coupon today for your free copy!



Keystone Steel & Wire Company
Peoria 7, Illinois

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Please send me the new booklet on Cold Heading Wire.

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KEYSTONE WIRE for Industry

Hubbard states that the "AA" series is suitable for trouble-free spooling or unspooling of any wire from .003 to .050 inches. Special anti-galvanic or other non-reactive finishes can be supplied if required.

★ ★ ★

Additional data can be obtained from Hubbard Spool Company, King Street, Garrett, Indiana.

Hamelin Opens New Reel Plant in Canada

The official opening of the new plant of **J. Hamelin Lumber and Woodwork Ltd.,** at 0760 St. Patrick St., Ville La Salle, Que., Canada, was marked on November 25, 1955 by appropriate ceremonies.

★ ★ ★

The new plant is larger and contains much new equipment for the manufacture of wood reels, including what is said to be the largest automatic nailing machine in America. It drives 24 nails simultaneously.

★ ★ ★

The company specializes in wood reels for Canadian wire and cable manufacturers and has grown steadily with the increasing demand for its products. **Joseph Hamelin,** who founded the business 17 years ago, heads the enterprise.

New Type Welded Heating Coils

A 4-page bulletin, issued by the Thermo-Panel Div., **Dean Products, Inc.,** 616 Franklin Ave., Brooklyn 38, N. Y., describes a new type of industrial heating or cooling coil, that may be used, for instance, in plating tanks.

★ ★ ★

The coil is not made of pipes, but of embossed plates that are welded together to form coils. The Thermo Panel may thus be formed of any metals for any type of liquid at relatively low cost, and be formed into J, U, cylindrical or other shapes.

★ ★ ★

Full details, including prices, are given in the bulletin, which will be sent to readers upon request.

1955 Book of ASTM Standards

Possibly the most important and certainly the biggest publication now in hand is the seven-part 1955 edition of the Book of ASTM Standards. This edition will total almost 12,000 pages, 17 per cent larger than the 1952 edition. Following previous practice, the seven volumes will be published as a grouping together of separate compilations. The books will be printed on a Bible-type paper but the stock will be somewhat more substantial and yet will bulk little more than did that used in the 1952 book. The seven parts are:

1—Ferrous Metals
2—Non-Ferrous Metals
3—Cement, Concrete, Ceramics, Thermal Insulation, Road Materials, Soils
4—Paint, Naval Stores, Wood, Cellulose, Wax Polishes, Sandwich and Building Constructions, Fire Tests
5—Fuels, Petroleum, Aromatic Hydrocarbons, Engine Antifreezes
6—Plastics, Electrical Insulation, Rubber, Electronics
7—Textiles, Soap, Water, Paper, Adhesives, Shipping Containers, Atmospheric Analysis

★ ★ ★

All the books are scheduled to appear during the next few months, starting with Part I which is now available.

★ ★ ★

Copies of all or of the parts may be purchased from the **American Society for Testing Materials,** 1916 Race St., Philadelphia 3, Pa.

Flame Plating Process Described in Booklet

A revolutionary flame plating process that is important to the wire and spring industries is described in a booklet issued by **Linde Air Products Co.,** 30 East 42nd St., New York 17, N. Y.

★ ★ ★

With this process, a thin coating of tungsten carbide can be applied to wire and spring forming tools, rolls, mandrels, arbors, dies, chain forming mandrels, etc., to increase life at cost savings.

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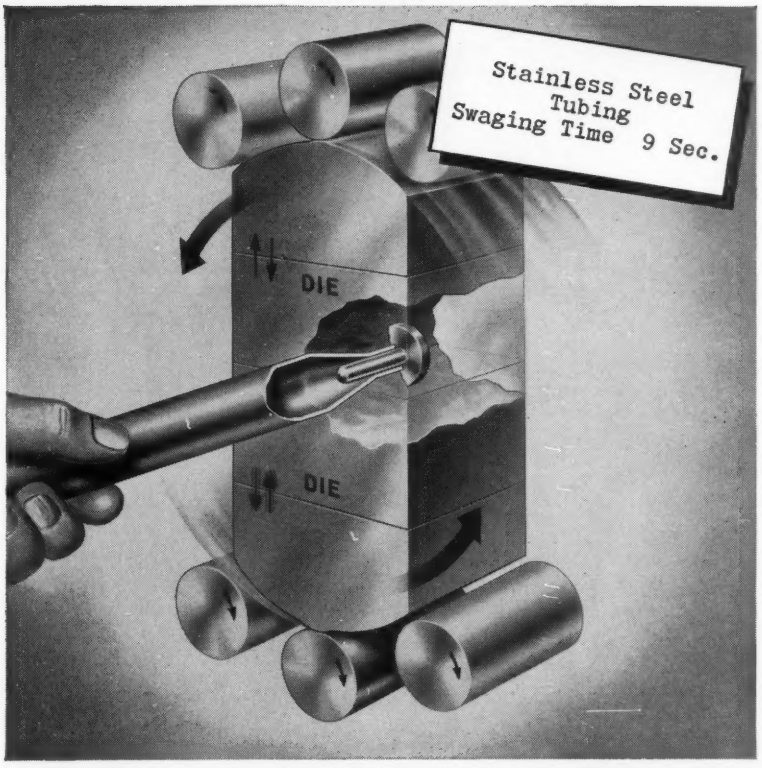
The booklet may be secured by writing to the company.



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You also save time, material and labor costs . . . greatly increase output . . . in a variety of pointing, tapering, reducing, sizing, forming and assembly operations.

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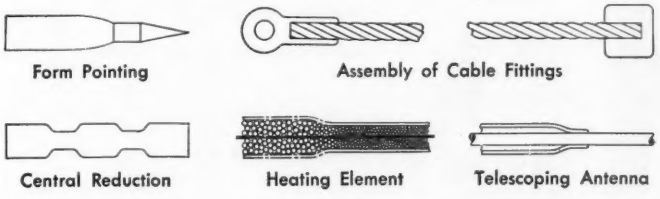

Check with Fenn for engineering advice on swaging your product or parts.

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Swaging Machines — Wire and Tube Drawing Machines

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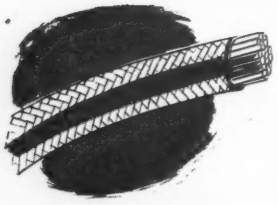

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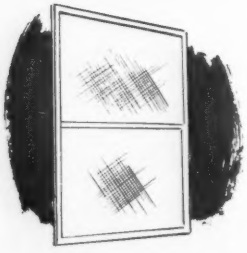
Solid drawn wire • Close tolerances • Accurate to size and shape • Uniform temper throughout Available on spools or in coils • Square, half-round and flat shapes available



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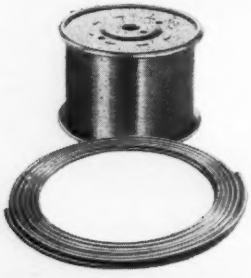

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LOOK TO UNITED FOR THE BEST IN ALUMINUM, COPPER AND BRASS TUBE AND WIRE

New Laboratory Rolling Mill

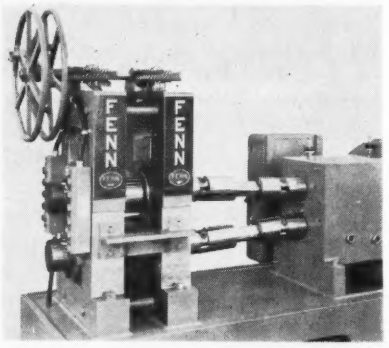
A new combination rolling mill, especially designed for laboratory use by **The Fenn Manufacturing Company** of Newington, Conn., features a unique drive which permits two-high operation, four-high operation with back-up rolls driven, and four-high operation with work rolls driven.

★ ★ ★

To shift from back-up roll drive to work roll drive, the drive couplings can be changed in a few minutes time. To shift from four-high to two-high operation, the work rolls and their bearings are removed; this is easily and quickly accomplished.

★ ★ ★

By varying the drive and the number of rolls used, this mill



FENN's new combination laboratory rolling mill, set for back-up roll drive.

operates efficiently over a complete range of reductions, from breakdown rolling to the thinnest gage practical. As a 2-high mill, breakdown passes can be taken. As 4-high with back-up rolls driven, intermediate passes can be taken on stock of substantial width. As 4-high with work rolls driven, light passes on all work and substantial passes on narrow work can be taken.

Condensed Reference File of Plastics and Resins

A new, revised, "1956 Condensed Reference File of Bakelite Plastics and Resins" presents the latest information about properties and uses of these materials supplied by **Bakelite Company, a Division of Union Carbide and Carbon Corporation,** 300 Madison Ave., New York 17, N. Y.

This 12-page booklet summarizes technical data about the wide range of special and general-purpose Bakelite phenolic, vinyl, styrene, polyethylene, fluorothene, polyester, silicone and epoxy plastics and resins, and Krene film and sheeting. More than 50 plastics and resins are described under appropriate headings.

★ ★ ★

Specific properties of Bakelite plastics and resins are set forth along with information about their ability to be processed in manufacturing operations. Typical products and uses of these materials are shown in 65 photographs.

★ ★ ★

The booklet also lists Company sales offices over the country, where information about specific plastics may be obtained.

Announcing a Heat-Sealable VPI

For the past two years, the **Orchard Paper Company** laboratory technicians in St. Louis have been working on the development of a VPI (Vapor Phase Inhibitor) material which would be heat-sealable. The company has now developed a material which satisfies this requirement.

★ ★ ★

Heat-Sealable VPI is a volatile rust inhibitor which should be of particular interest to manufacturers who are now using automatic heat-sealing packaging machinery. Heat-Sealable VPI is supplied in a 35# Kraft sheet coated with two grams of VPI per square foot. This is available in standard rolls 36″ x 200 yards, weighing approximately 48# per roll. It can also be supplied in narrower width rolls and in sheets.

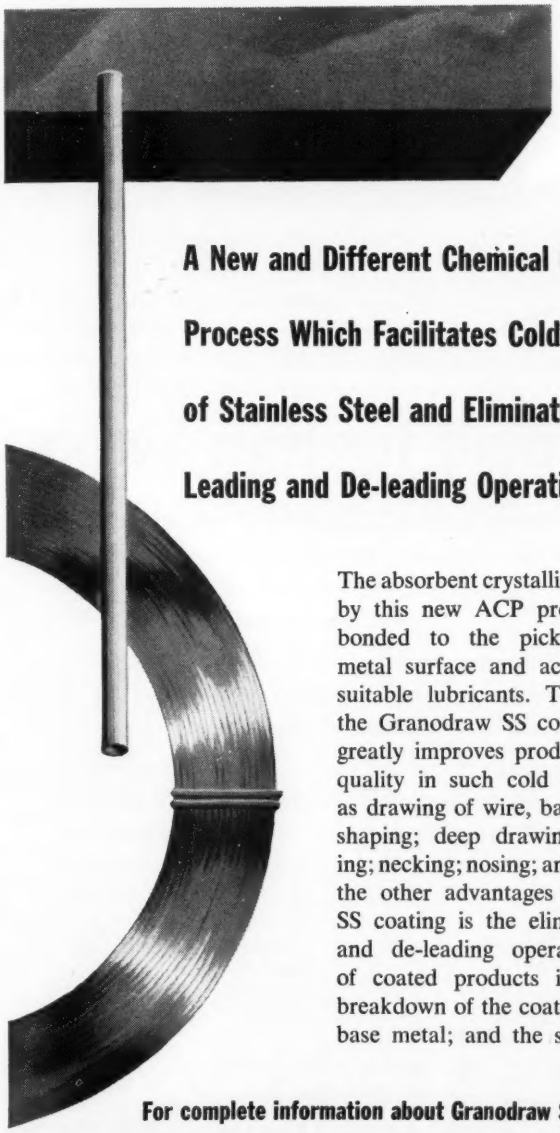
★ ★ ★

This material has passed rigid laboratory tests equal to the Bureau of Aeronautics qualification under Specification MIL-P-3420 and it will be submitted to the Bureau for further qualification.

★ ★ ★

Additional information and samples are available by writing Orchard Paper Company, 3914 Union Blvd., St. Louis 15, Mo.

ANNOUNCING GRANODRAW SS®



A New and Different Chemical Coating Process Which Facilitates Cold Forming of Stainless Steel and Eliminates Leading and De-leading Operations

The absorbent crystalline coating produced by this new ACP process is chemically bonded to the pickled and activated metal surface and acts as a carrier for suitable lubricants. The combination of the Granodraw SS coating and lubricant greatly improves production and product quality in such cold forming operations as drawing of wire, bars and tubing; cold shaping; deep drawing; stamping; ironing; necking; nosing; and upsetting. Among the other advantages of the Granodraw SS coating is the elimination of leading and de-leading operations; the storing of coated products indefinitely without breakdown of the coating or pitting of the base metal; and the short coating cycle.

For complete information about Granodraw SS, write ACP today

AMERICAN CHEMICAL PAINT COMPANY, Ambler 30, Pa.
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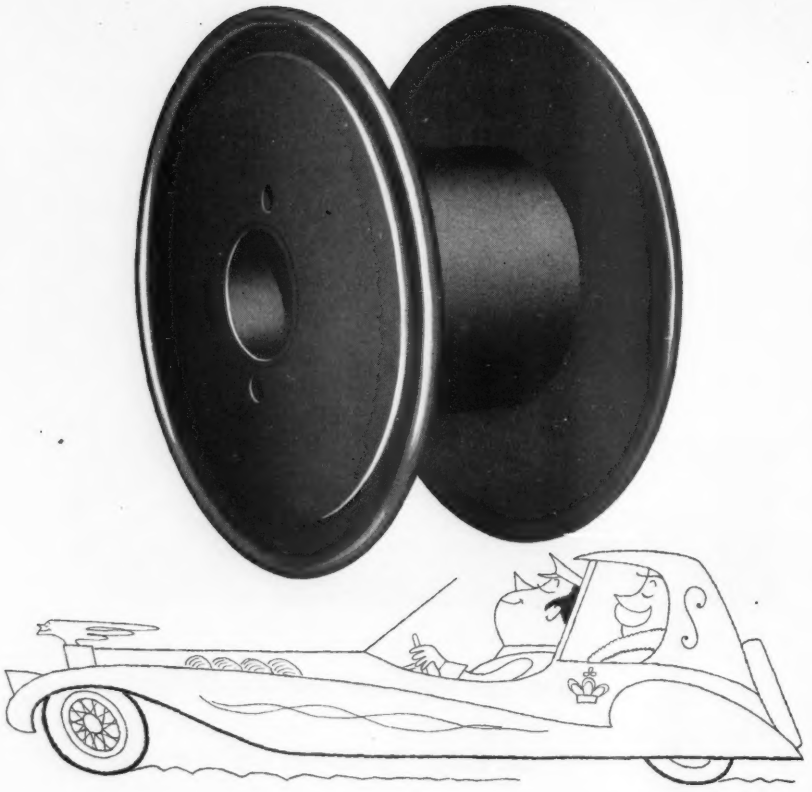

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Apco Mossberg steel reels, spools, and bobbins are true works of custom engineering and manufacture . . . they are furnished to fit the exacting requirements of each individual customer.

Whatever the sizes or shapes you need in reels, spools, or bobbins, Apco Mossberg will furnish them manufactured to extremely close tolerances of balance and trueness.

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APCO MOSSBERG COMPANY

ATTLEBORO, MASS.

World's Biggest Braiding Machine at National-Standard

A 25-ton braiding machine with alternate decks up to 96 carrier size, the largest braider of its kind in the world, fabricates braid capable of sustaining end loads as high as 60 tons.

★ ★ ★

The three-story-high machine, owned and operated by **The National-Standard Company** at its Niles, Mich., plant, produces the braid for the metal hose industry and for other tubular braid applications.

★ ★ ★

This machine commonly fabricates braids as large as 22 inches and it could make a braid 30 inches in diameter by use of the mandrels of proper size. The carriers in the 96 carrier deck can handle wire up to .028 inches in diameter and as many as 15 parallel wires, and 29 wires or groups of small diameter wires in braided braid. Braided braid is tubular braid constructed of multiple flat braids.

★ ★ ★

The machine will provide electrical shielding for high frequency cable, as armor to protect tubes or cables from mechanical abuse or abrasion, and for other applications requiring strength and flexibility.

★ ★ ★

The braider was developed jointly by National-Standard and **Textile Machine Works** of Reading, Pennsylvania, for experimental work, and was soon adapted to its present broad use. In addition, a specially designed set of tracks was constructed to facilitate the interchange of decks.

Economist Expects 50% Additional Aluminum Expansion in Five Years

The aluminum industry can be expected to expand at least another 50 per cent over the next five years, an economic authority states.

★ ★ ★

Reviewing the general business

outlook for members of **The Aluminum Association** at their Autumn meeting, **Dexter M. Keezer** said that prospects for the aluminum industry are even brighter than those for business generally. He pointed out that over the past five years the rate of expansion of the aluminum industry has outstripped that of the economy as a whole in a ratio of about five to one.

★ ★ ★

Prospects are that the business boom, now proceeding at an all-time record rate, will carry on well into 1956, but necessarily at a somewhat more subdued rate than that of which it has surged forward thus far in 1955. The fact that we have virtually run out of people to fill jobs, he stated, makes some slowdown in the pace of the boom inevitable.

New Easy-To-Read Price Schedule

A completely new 30 page price schedule on Monel, Nickel, Inconel and stainless steel wire-rod-strip is now available for the asking.

★ ★ ★

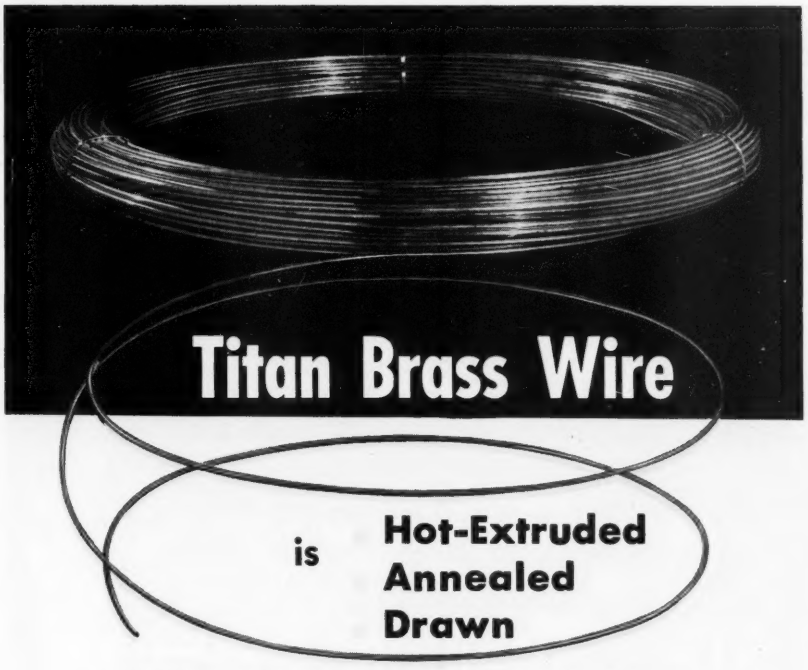
Survey of 4,000 users of our metal was first made to learn type of price schedule they wanted. As a result price schedule is greatly simplified, easier and faster to use. Many new innovations such as Specifications Index, pictures story of how metals are made and tested, complete priority information on government priority system for metals and tells how many companies who are not aware of their eligibility can self-authorize priority rating. One purchasing agent's comment was, "Best help for buyers that's come out in a long time."

★ ★ ★

For a copy, write to **Techalloy Co., Inc.**, Rahns, Pa.

Anaconda To Use Non-Returnable Reels

The Anaconda Wire and Cable Company has adopted a program of making shipments of certain types of wire and cable on non-returnable reels. Initially, the program will be more or less confined to shipments of Building Wire



for highest strength and quality

Titan Brass Wire has precisely uniform gauge . . . color . . . texture . . . temper . . . is free from physical defects. For making highest-quality rivets, bolts, nuts, eyelets, fasteners, screws, studs, binding posts, terminals, washers, pins and nails . . . order Titan Brass Wire. Compositions and tempers are supplied to meet every requirement. Let us help you choose the proper wire composition and temper for **Heading & Extruding**
Heading & Drilling or
Forming & Bending

Call your nearest Titan Office

Offices and Agencies in these cities:

Atlanta	Denver	New Orleans	Seattle
Camden	Detroit	New York	St. Louis
Chicago	Houston	Old Lyme, Conn.	St. Paul
Cincinnati	Indianapolis	Salt Lake City	Toledo
Cleveland	Los Angeles	San Francisco	Washington

Mill Depots: Bellefonte, Pa., and Indianapolis

Write today for free folder "Titan Brass Wire" listing grain sizes, weights, tolerances and other data. Address: Customer Service Division, Titan Metal Mfg. Co., Bellefonte, Pa.

Titan®

METAL MANUFACTURING COMPANY
General Offices & Plants: Bellefonte, Pa.
Quality Alloys by Brass Specialists

...and here's why!

Now you can enjoy lower freight charges and greater protection against damage with the new, lighter weight NYECO steel reels. They cost so little more, last 12 times longer than wooden reels, require minimum maintenance. Rugged weatherproof, splinter-proof, warp-proof protection protects costly cable against damage due to dropping, bouncing, rough handling.

Think it over and you'll agree that it doesn't pay to risk an investment of thousands . . . and your reputation . . . on inferior reels.

* These leading mills are just a few of the many that prefer **NYECO** Steel Reels: **OKONITE, ROEBLING, WESTERN ELECTRIC, GENERAL CABLE, ANACONDA, PHELPS DODGE**

- *ANY QUANTITY*
- *ANY SIZE*
- *ANY LOAD*
- *FLANGE DIAMETER From 36" UP*

Write • Phone • Wire

NYECO

Specialists to the Wire Industries for Over 45 Years

NEW YORK ENGINEERING COMPANY

75 West Street, New York 6, N. Y.

TELEPHONE: WHitehall 4-5380 **CABLE:** NYECO, N. Y. **PLANTS:** YONKERS, N. Y.

items to distributors' stocks and to Aluminum insulated and covered conductors. Experience will dictate the ultimate scope of the new program.

★ ★ ★

The types of non-returnable reels used by Anaconda have withstood commercial shipments to all sections of the United States over the past year and they have proven adequate on all occasions.

★ ★ ★

Some of the benefits which will accrue to the customer in this program are:

Elimination of reel deposit charges.
Elimination of clerical records for the maintenance of reel data.
Reduction of storage space.
Reduction in overall weight.
Elimination of reel returns to the manufacturer.

★ ★ ★

New Booklet Covers Waterbury Farrel Wire Flattening Mills

A new 12-page, illustrated booklet published by **Waterbury Farrel Foundry and Machine Co.,** Waterbury, Conn., gives details on the wide range of 2-high Wire Flattening Mills and auxiliary equipment produced by the company.

★ ★ ★

This equipment is custom-engineered for specific applications in flattening ferrous, non-ferrous and clad metal wire in diameters from a few thousandths of an inch up to one inch at speeds approaching 3,000 fpm.

★ ★ ★

Extensively illustrated, the booklet shows a variety of single and multiple stand mills built by the WF Rolling Mill Machinery Division. Mill construction features covered in the text include, Rolls, Housings, Screwdown, Universal Joints, Drive and Lubrication.

★ ★ ★

Approximately half of the booklet is devoted to the auxiliary equipment available for a complete mill installation. Illustrations and text give detailed information on Payoffs, Edgers, Winders, Dancer Roll Control Stand, Coolant Systems, and various optional features.

Free copies of this booklet can be obtained by requesting circular No. 731-R from Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

Booklet on Diamond Powder Finishing

"Finish With Diamond . . . Elgin Diamond!" is the title of a new booklet issued by the **Abrasives Division** of **Elgin National Watch Co.,** Elgin, Ill.

★ ★ ★

In this is described and illustrated the methods of using the Elgin Dymo Applicator Gun in finishing jobs with pre-mixed diamond powder compounds.

★ ★ ★

The applications include drawing dies and other carbide products and the information will be found of practical assistance in the use of these compounds.

★ ★ ★

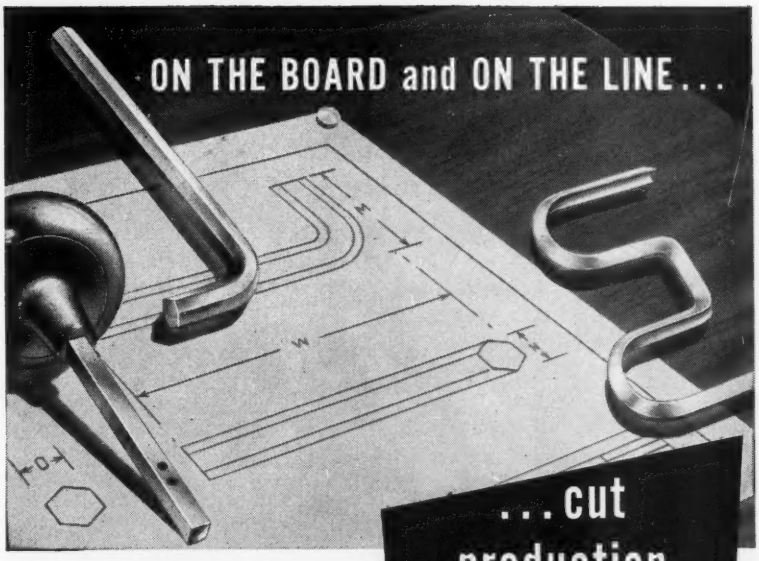
For a copy, write the company at Elgin, Ill.

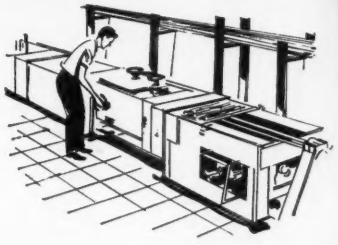
Booklet on Grinding Wheel Selection

"How to Select Grinding Wheels for Precision Grinding, Tool and Construction Steels" is the title of a booklet available from **Norton Company,** Worcester 6, Mass. This booklet consists of reprints of three articles that appeared in "Grits and Grinds," Norton's monthly magazine on better grinding. The articles were written by **Clifton C. Nickerson,** Norton grinding engineer. They are liberally illustrated with photographs and charts.

Four Electrical Manufacturers Join NEMA

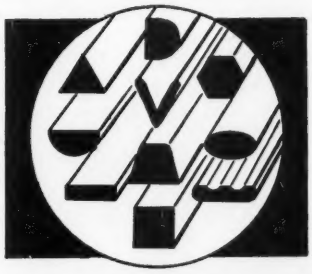
Four more electrical manufacturers joined the **National Electrical Manufacturers Association** (NEMA), it was announced in November by **J. W. Corey,** president of the Association. The new members are: **Coppus Engineering Corp.** Worcester, Mass.; **The A. C. Gilbert Co.,** New Haven Conn.; **The Lau Blower Co.,** Dayton, Ohio; and **The Wilcolator Co.,** Newark, N. J.





...cut production costs with CONTINENTAL® Special Shaped Wire

You can engineer greater savings in production when you use Continental round or special shaped wire. Usually you can reduce costs on expensive forging, stamping and rolling operations by using Continental special shaped wire. For product-trim or as a basic component, the right wire can help you cut corners—and you can get the right wire at Continental. We have solved countless problems in supplying wire for thousands of applications, in a great range of sizes and shapes, temper, finish and analysis in low or medium low carbon. Before you fill any wire need—check with Continental, wire headquarters for many firms. Write us today.



STANDARD AND SPECIAL WIRE SHAPES

flat	keystone-shaped
half-round	V-shaped
round	hexagonal
oval	grooved flat wire
half oval	special wire trim designs
square	bread-shaped
rectangular	D-shaped

CONTINENTAL
STEEL CORPORATION • KOKOMO, INDIANA

WIRE SPECIALISTS FOR OVER HALF A CENTURY

Producers of Manufacturer's Wire in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

New WARDWELLIAN®

Pay-Off Stand

An improved Pay-Off Stand for delivering small diameter soft drawn wires from supply spools in the process of winding single or multiple ends on metal spools as supplies for WARDWELL RAPID BRAIDERS and other uses.

Maximum diameter wire approximately .012.

Due to the system used the wire strands can be payed off rapidly to deliver properly to the winding machine.

Supply spools are mounted in substantially vertical position to allow the strands to pay off over the spool heads.

Each strand of wire feeds around an individual tensioning roll adjustable for securing any desired tension.

This method of applying tension to each individual strand results in uniform tension on all strands.

A cylindrical guard surrounding each spool prevents interference between the strands during ballooning as they unwind from the spools. Guards can be raised and lowered for easy mounting and removal of supply spools.

Guides for wires are made of long-wearing Heanium material.

An auxiliary guide-stand for feeding strands to winder furnished with each Pay-Off Stand.

Stand will accommodate eight spools or can be extended for twelve supplies at slight additional cost.

Maximum diameter of supply spool head 8".

A standard set of eight spool-caps furnished with each stand.

Spool dimensions including diameter of bore must be furnished when ordering.

Weight of standard type for eight supply spools approximately 270 lbs.

Complete information on request

Ask about our other machines for braiding, shielding with wire, tape serving, yarn serving, asbestos serving, paper serving, armor serving and resistance wire serving.

WARDWELL
BRAIDING MACHINE CO.

Central Falls
Rhode Island, U. S. A.

Representatives for Europe, British Colonies and Dependencies
JAMES MACKIE & SONS, LTD., BELFAST, IRELAND

Association Clock Wound for 1956

Messrs. R. S. Bleckly, Director and General Manager, and **William O. Copland,** General Works Manager, Rylands Brothers Limited, Warrington, England, called at The Wire Association's headquarters, on November 29th, in Stamford, Conn., to wind the grandfather clock presented to the Association by its British members in 1948 by **John Rigby** on behalf of his industry confreres.

★ ★ ★

The clock, a beautiful affair in a handsome antique case, runs for four hundred days on one winding and is traditionally wound by one of our British members. Mr. Bleckly started the winding, and

L to R: Messrs. Copland and Bleckly

Mr. Copland completed it, each thus participating in the annual ceremony.

★ ★ ★

The two gentlemen from Warrington have been in this country for some weeks, and attended the Annual Convention in Chicago. During their sojourn, their travels took them from Coast to Coast, providing them with opportunities to visit a number of mills.

★ ★ ★

We are most grateful to them for their courtesy in taking time out from a busy itinerary to perform this duty, and trust that we may see more of them at our meetings in the years to come.

Outstanding Personalities of the Wire Industry

Bieber Elected President of Acrometal Products

Fred J. Bieber, vice president and general manager of Acrometal Products of Minneapolis, Minn., leading manufacturer of precision spools for the wire industry, has been elected president of Acrometal. The announcement was made jointly by **C. D. Brooks,** retiring president, who is also president of **U. S. Bobbin & Shuttle,** and **John G. Jackson, Jr.,** chairman of the board, following a meeting of the directors in New York City.

★ ★ ★

Acrometal Products, under Mr. Bieber, who came to the company as general manager only five years ago, has made phenomenal progress. The company, prior to that time, was in a relatively obscure position in the spooling industry. It began to forge rapidly ahead, however, until today, Acrometal is recognized as an outstanding producer of precision spools for the wire industry.

★ ★ ★

Mr. Bieber has insisted upon bold research, tempered with sound engineering. This policy has paid off in view of the many practical improvements and innovations introduced by the company in recent years to help wire manufacturers do a better packaging job.

Fred J. Bieber

★ ★ ★

He brought a varied production experience to Acrometal. He had previously served in executive-management capacities of such companies as **Remington Rand, Scovill Mfg. Co., Casco Products,** and **V and O Press Co.,** before tackling the job of making better spools for wire. He has brought to the business not only the kind of friendliness that considers everyone's problems his own, but an engineering experience that goes to work to solve those problems.

★ ★ ★

Acrometal recently completed a major expansion in factory space, adding a new wing with 8,000 feet of new production line space to keep up with demand.

A size and type machine available to make everything from tacks and brads to 12" spikes with maximum efficiency.

Write for 12 page bulletin with complete information on nail making equipment.

WM. GLADER MACHINE WORKS 210 N. RACINE AVENUE CHICAGO 7, ILLINOIS

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

Acrometal ships spools to all of the leading magnet wire manufacturers in this country and many producers abroad. They now produce a complete line of aluminum alloy spools, steel spools, and big shipping reels. Their most popular number is a welded aluminum-alloy spool in which the head is an integral part of the barrel.

Ajax Electric Names Sales Manager

Edward N. Case has been appointed Sales Manager of the **Ajax Electric Company**, Philadelphia, salt bath furnace manufacturers. **L. B. Rosseau,** Vice President, announced that Mr. Case will be in charge of all field sales activities from the Philadelphia office.

★ ★ ★

Mr. Case comes to Ajax from the American Cyanamid Company where he spent 12 years, the last few as Manager of the Metal Chemicals Section. His experience covers the metalworking field including laboratory work, technical service, direct selling, sales promotion, and management. He has been granted several patents, contributed articles to a number of publications and has been in demand as a speaker before various technical societies.

★ ★ ★

He is a graduate of Union College, and took post graduate work in metallurgy and chemistry at Brooklyn Polytechnic Institute.

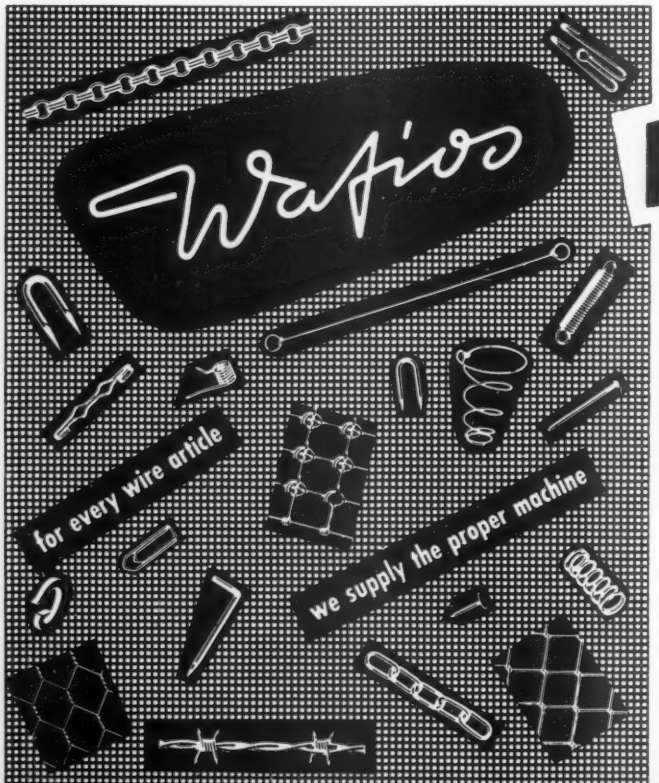
Edward N. Case

Transferred to Extrusion Materials Division of Bakelite

William J. Canavan has been appointed Assistant Manager of the Extrusion Materials Division, **Bakelite Company,** a Division of **Union Carbide and Carbon Corporation.** Mr. Canavan joined the Bakelite Company as a Technical Representative in the Wire and Cable Materials Division in 1944. In 1951 he was transferred to the New Product Engineering Department as a Development Engineer on extrusion materials. Early in 1955 he was appointed Assistant to the Works Manager in the Manufacturing Department.

To Manage New Design Engineering Section for Carboloy

E. J. Weller, manager of tool sales, **Carboloy Department** of **General Electric Company,** Detroit, has been named manager of a newly established carbide prod-



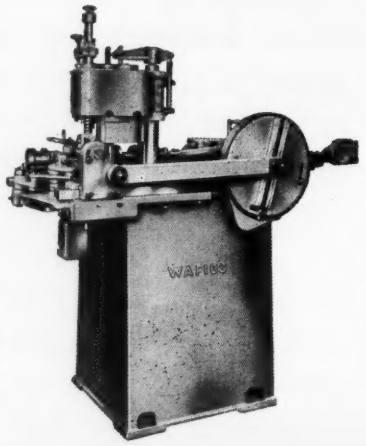
AUTOMATICS

FOR THE WIRE TRADE

AUTOMATIC TORSION SPRING COILING MACHINE

Model SFM, 4 different sizes

Wire Range: .008—.315"



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Kurt Orban Co., Inc.
34 Exchange Place,
Jersey City 2, N. J.

WAFIOS MASCHINENFABRIK REUTLINGEN 3 / GERMANY

ucts design engineering section.

★ ★ ★

Mr. Weller directed tool sales following a year's service as carbide design and application engineer—upon transferring to Carboloy from G. E.'s Turbine Division materials and process laboratory at Schenectady. He began his career with G. E. as an apprentice machinist in 1937, becoming a diemaker shortly thereafter. He is an author of several articles on development of improved tool designs and machining practices.

Nopco Appoints New West Coast Sales Managers

Joseph E. Connell and **Robert J. Kingsley** have been named sales managers of new sales departments set up by the Pacific Division of the **Nopco Chemical Company.** The announcement was made by **Perc S. Brown,** Vice President of Nopco in charge of the Pacific Division.

★ ★ ★

The new sales departments are part of Nopco's West Coast expansion program. Previously, one sales manager was responsible for Nopco's sales. Under the new setup, each field will be handled independently, thus making possible an intensified sales effort.

★ ★ ★

Mr. Connell, as Sales Manager of industrial chemicals, will be in charge of sales of Nopco chemicals as well as the Metasap Chemical Company, producer of stearates, a subsidiary of Nopco.

Anaconda Elects Caples to V. P. Post

Russel B. Caples, president of **Anaconda Aluminum Co.,** was recently elected vice president-metallurgical operations of the parent company, **Anaconda Co.,** New York. He will be assisted by **William Wraith Jr.** At the same time **C. Jay Parkinson** was elected vice president of Anaconda Aluminum and **Robert F. Buechner** was named assistant to the president.

To Head G. E.'s Insulating Products Engineering Department

Carl A. Drake has been appointed Manager-Manufacturing Engineering Unit at the **General Electric Company's** Laminated & Insulating Products Department, according to a recent announcement by **H. A. Howe,** Manager-Manufacturing for the department.

★ ★ ★

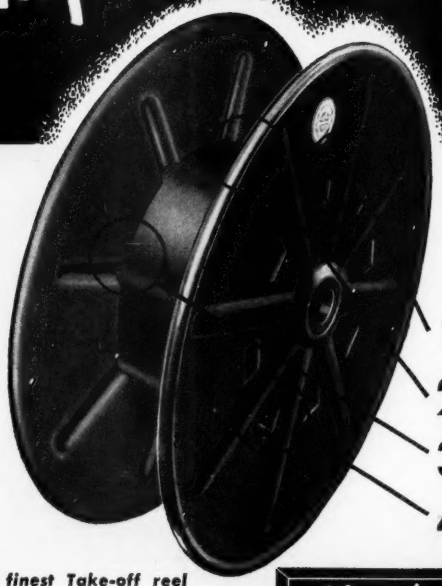
Mr. Drake received a BME degree in 1939 from Ohio State University and holds a reserve commission in the engineer corps of the National Guards. He will continue to be located at the headquarters of the Department in Coshocton, Ohio.

New Carbide Sales Office and Warehouse Opens in Detroit

Coincident with the establishment of combined sales office and warehouse at 18320 West McNichols Road, **Firth-Loach Metals, Inc.** of McKeesport, Pa., announces

Important DIFFERENCES

BETWEEN JUST ANY REEL AND All Welded MPS



TAKE-OFF REELS

Three important differences that mean longer reel life in both processing and handling of all types of insulated wires in your plant.

1 **New MPS deep wide, straight type embossed radial rib** adds considerable strength to reel heads over the old style narrow tapered rib.

2 **Increased height of the curled edge** adds even more strength and rigidity, especially to the rims.

3 Furnished with **rib fillers** that are projections on the end of the barrels that fit into the embossed radial ribs thereby **eliminating any marking of the plastic or rubber insulated wires** at the junction of head-barrel.

4 Finally, the **all welded "J" type construction** of the entire reel completes the picture.

The finest Take-off reel you can buy.
We invite your inquiries — let us tell you more about MPS Take-off Reels. Write us today.

Mossberg PRESSED STEEL Corporation

18 West Street — Attleboro
Massachusetts U. S. A.
Telephone Attleboro 1-0848

#109

the appointment of **William H. Fritz, Jr.** as District Manager and **William D. Huston** as Sales Engineer.

★ ★ ★

The new offices located here will provide Detroit manufacturers and tool and die shops with rapid deliveries of a wide range of standard cemented carbides used in cutting and forming metal.

★ ★ ★

Mr. Fritz had been Michigan Sales Representative for Firth-Loach, and since 1940 he has been closely connected with carbide and tool steel applications to metal cutting problems. He was formerly associated with **Firth-Sterling Inc.** and **Latrobe Steel Company** as sales engineer.

★ ★ ★

Mr. Huston has been in the tool steel and carbide industries for the last ten years. Prior to joining Firth-Loach, he was associated with Kennametal, Inc.

To Head Fasteners, Inc.

Judson B. Shafer was recently elected president and general manager, **Fasteners Inc.,** subsidiary of **Phillips Screw Co.,** New York. He was previously the company's executive vice president. **C. M. Cambern,** former president, is now chairman of the board, and continues as president-general manager of the parent company. Mr. Shafer will retain his position as executive vice president and director of the parent company.

Pittsburgh Steel Appointments

Daniel Neuman and **Donald J. Shaughnessy** were recently made Assistant Managers of Production Planning, and **John L. Jones** was appointed staff assistant in the same department by the **Pittsburgh Steel Company,** Pittsburgh, Pa., with offices in the Grand Building. Mr. Neuman, who was formerly Manager of the Order Schedule Department, has been a member of The Wire Association for many years.

Pittsburgh Steel Products Appoints Representatives

Pittsburgh Steel Products Co., a subsidiary of **Pittsburgh Steel Co.,** has named three Material Handling Engineers to cover the New York, Detroit and Chicago areas.

★ ★ ★

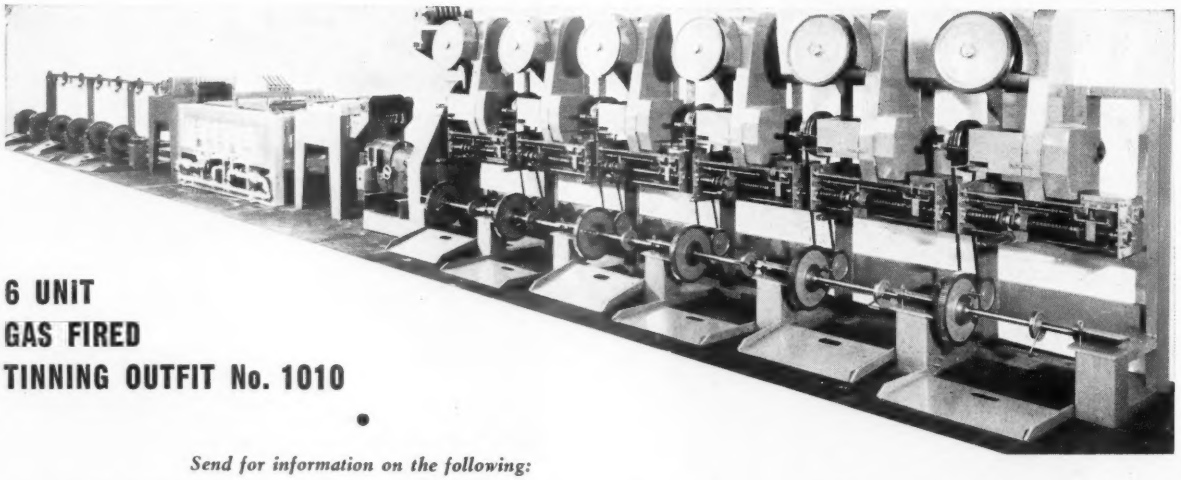
John P. Bourbeau, 32, was assigned the New York territory. He is a graduate of the Massachusetts Maritime Academy and the American International College.

★ ★ ★

From the Chicago office, **Robert K. Lohman** will handle sales in 11 Midwestern states. Mr. Lohman, 33, graduated from the University of Illinois in 1942.

★ ★ ★

Russel H. Nutter, 31, will cover Michigan and Toledo, Ohio, with headquarters in Detroit. He is a native of Montreal, Canada, and a graduate of Cornell University.



6 UNIT
GAS FIRED
TINNING OUTFIT No. 1010

Send for information on the following:

WIRE ANNEALING, TINNING and GALVANIZING OUTFITS

MULTIPLE or SINGLE UNIT WIRE TAKE-UPS

FINE WIRE DRAWING MACHINES

MAGNET WIRE ENAMELING EQUIPMENT, INCLUDING

PRE-ANNEALERS, SYNTHETIC ENAMEL APPLICATORS and CIRCULATING SYSTEMS

COTTON, GLASS-FIBRE and TAPE COVERING MACHINES

EST. 1855 AIMco INC. 1915

"American" AIM INSULATING MACHINERY COMPANY

REG. U.S. PAT. OFF.

FAIRHILL AND HUNTINGDON STREETS

PHILADELPHIA 33 PENNSYLVANIA U.S.A.

Rogers Has New Duties at Wean Equipment

Wean Equipment Corporation, Cleveland, Ohio, has announced that **John W. Rogers** has been appointed Director of Sales and Engineering. Formerly Sales Manager, he now carries on these duties with responsibility for engineering added.

★ ★ ★

At the same time the appointment of **Albert J. Sarka** as Chief Development Engineer and **Kenneth R. Keska** as Chief Engineer, was also announced.

★ ★ ★

Wean Equipment Corporation manufactures a line of fence-making machines, wire flattening mills, nail galvanizing units, wire galvanizing take-up frames and other steel mill equipment.

C F & I Elects Officers

At a special meeting the board of directors of **The Colorado Fuel and Iron Corporation** reelected **A. F. Franz** as president, it was announced by **Charles Allen, Jr.,** who continues as chairman of the board.

★ ★ ★

All other officers of the Company were also reelected:

Carl W. Meyers, Vice Chairman
A. C. Bekaert, Vice President, Finance
Franklin Berwin, Vice President
F. S. Jones, Vice President, Sales
J. J. Martin, Vice President, operations
H. C. Allington, Vice President, Sales Eastern Division
H. C. Crout, Treasurer
D. C. McGrew, Secretary
Earl D. Page, Controller.

★ ★ ★

Also, William M. White of Pueblo, Colorado, a director, was elected a member of the finance committee.

Surface Combustion Elects Two Officers

Henry M. Heyn and **Albert L. Hollinger** were elected vice presidents of **Surface Combustion Corp.,** Toledo, O. Mr. Heyn had been sales manager of the Heat Treat Division and Mr. Hollinger was manager of the Steel Mill Division.

To Sell Molykote Lubricants in Detroit Area

Penn Petroleum Company, Detroit, Mich., has been appointed the exclusive distributor for Molykote Lubricants in the Detroit area, it was recently announced by **Alfred Sonntag,** president of **The Alpha Molykote Corp.,** Stamford, Conn.

★ ★ ★

The president of Penn Petroleum, **James W. Hopkinson,** is the current head of The American Society of Lubrication Engineers.

Hamaker Retires

Roswell L. (Hammy) Hamaker, District Manager of the **Warner Company,** 104 E. 40th St., New York City, lime manufacturers, retired from business on January 1, 1956.

★ ★ ★

Hammy will be missed at our Conventions and Regional Meetings, as he has been one of our most consistent attendants since

(Please turn to page 120)

CAMDEN WIRE CO., INC.

Wire Fabricators

Producers of Quality Fine Wire Copper Conductors

EXTRA FLEXIBLE CONDUCTOR STRANDED OR BRAIDED

MULTIPLE ENDS OF SIZES .008 to .002

BARE • TIN or LEAD COATED • SILVER PLATED

Special Heavy Tinned Conductors for Hook-up Wire

40 MASONIC AVENUE • CAMDEN, NEW YORK

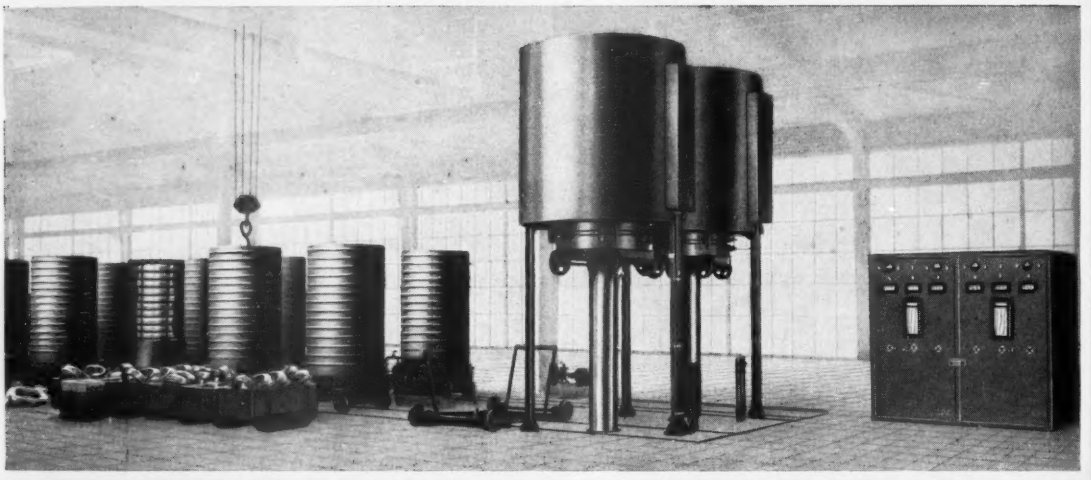
Table 5. – Refined copper produced at primary plants in the United States, 1953-54 (monthly averages) and 1955, by months, in short tons

	From primary materials			From scrap		
	Domestic	Foreign	Total	New	Old	Total
1953	77,686	30,074	107,760	9,165	6,634	15,799
1954	70,143	30,850	100,993	8,518	6,477	14,995
1955:						
January	88,312	28,841	117,153	10,123	4,920	15,043
February	81,021	29,994	111,015	8,278	6,295	14,573
March	94,260	26,351	120,611	10,332	7,453	17,785
April	85,118	26,230	111,348	11,076	6,452	17,528
May	96,549	30,575	127,124	11,725	6,034	17,759
June	89,444	28,195	117,639	11,642	7,190	18,832
July	21,294	21,272	42,566	7,412	3,525	10,937
August	55,824	23,081	78,905	8,790	4,633	13,423
September	97,234	32,557	129,791	13,875	6,329	20,204

From monthly Copper Report No. 45, Bureau of Mines.

VACUUM-BRIGHT ANNEALING PLANTS

guarant 100% bright, non-adhesive annealed articles



BRAUN-ANGOTT

INDUSTRIEOFENBAU HAGEN · GERMANY

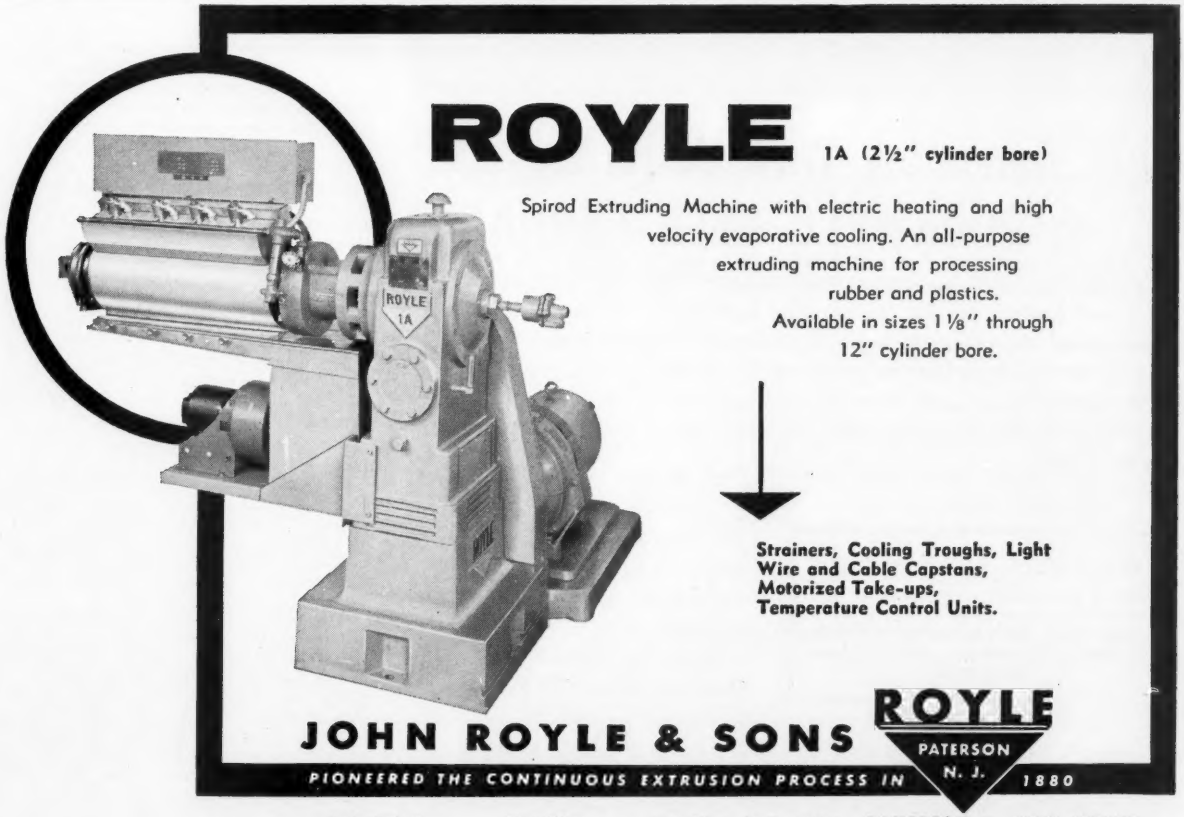
ALUMINUM STATISTICS
(in pounds)
Collected by The Aluminum Association
for September 1955

	September 1955	August 1955	September 1954	1st 9 Months 1955	1st 9 Months 1954
PRIMARY PRODUCTION	261,211,002	267,101,817	240,664,643	2,313,382,992	2,174,378,648
SHIPMENTS OF ALUMINUM PRODUCTS					
SHEET and PLATE.....Total	120,744,707	130,104,460	87,126,137	1,041,726,255	747,767,157
Non Heat-treatable	95,487,885	107,123,187	69,040,425	829,910,294	576,793,139
Heat-treatable	25,256,822	22,981,273	18,085,712	211,815,961	170,974,018
FOIL (including foil in lamination, aluminum content only)	18,376,581	17,926,890	13,300,419	150,426,129	106,873,106
EXTRUDED PRODUCTS.....Total	33,711,042	35,619,453	23,087,663 *	301,862,861	201,421,968 *
Alloys 1100-3003-5052-6061-6062-6063	31,168,425	31,846,173	19,146,454 *	270,726,278	153,969,955 *
All other alloys	2,542,617	3,773,280	3,941,209	31,136,583	47,452,013
TUBE, Drawn.....Total	4,263,911	4,838,170	3,713,147	58,132,422	44,690,734
Alloys 1100-3003-5052-6061-6062-6063	3,566,076	4,189,108	3,119,304	52,991,520	38,388,906
All other alloys	697,835	649,062	593,843	5,140,902	6,301,828
BAR and ROD, Rolled (3/8" and over, maximum diameter across flats)	15,036,454	14,276,056	13,406,488	133,373,274	106,790,881
WIRE other than Conductor	4,281,775	4,322,976	3,335,368	35,585,930	27,005,686
ACSR and CABLE, Bare	10,003,930	12,057,710	9,751,496	92,834,902	88,242,782
FORGINGS	4,103,694	3,562,562 *	3,447,277	34,837,524 ≠	33,475,694
CASTINGS (incl. pistons, cookware)...Total	14,990,563	14,063,001	11,366,448 ‖	140,843,105 ‖	110,393,168 ‖
Sand	1,547,743	1,414,300	1,576,013	14,760,994	15,954,625
Permanent Mold	13,442,820	12,648,701	9,790,435	126,082,111	94,438,543
Total number of companies included	44	44	42 *		

November 9, 1955

* Revised from previous reports. ‖ No longer includes die casting shipments.
≠ Includes increase of 83,385 lbs. in July shipments of forgings.

Aluminum Statistics


ROYLE
1A (2½" cylinder bore)
Spirod Extruding Machine with electric heating and high velocity evaporative cooling. An all-purpose extruding machine for processing rubber and plastics.
Available in sizes 1⅛" through 12" cylinder bore.
Strainers, Cooling Troughs, Light Wire and Cable Capstans, Motorized Take-ups, Temperature Control Units.
JOHN ROYLE & SONS
ROYLE
PATERSON N. J. 1880
PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN
London, England James Day (Machinery) Ltd. Hyde Park 2430 - 0456
Home Office V. M. Hovey J. W. VanRiper SHerwood 2-8262
Akron, Ohio J. C. Clinefelter SWandale 4-5020
Los Angeles, Cal. H. M. Royal, Inc. LOgan 3261
PATERSON 3, NEW JERSEY

A Review of Recent Wire Patents

No. 2,722,005, MACHINE FOR ASSEMBLING WIRE BAILS ON BROOM CAP HANDLES, patented November 1, 1955 by Spencer C. Tuttle, Waterbury, and Clyde W. Garthwait, Jr., Cheshire, Conn., assignors to Cly-Del Mfg. Co., Waterbury, Conn., a corporation of Connecticut.

This is a machine for assembling preformed looped wire bails having inturned ends to hollow broom handle caps having apertures on opposite sides thereof.

★ ★ ★

No. 2,722,242, WIRE FORMING APPARATUS, patented November 1, 1955, by Lloyd Talbot, Chicago, Ill., assignor to Cedar Rapids Block Co., a corporation of Iowa.

The inventor provides an automatically operated wire shaping machine for forming a reinforcing material from three continuous lengths of wire. There are ten claims.

★ ★ ★

No. 2,722,492, INSULATED ELECTRICAL CONDUCTOR, patented November 1, 1955 by Robert H. Ralston, Kennett Square, Pa., assignor to Hercules Powder Company, Wilmington, Del., a corporation of Delaware.

About the wire conductor is an insulating sheath of a polymer of the group consisting of homopolymers of 3,3-bis(chloromethyl) oxetane, copolymers of 3,3-bis(chloromethyl) oxetane with other 3,3-disubstituted oxetanes, or copolymers of 3,3-bis(chloromethyl) oxetane with oxetane admixed with a nonsolvent plasticizer therefor.

★ ★ ★

No. 2,722,493, INSULATED ELECTRICAL CONDUCTOR, patented November 1, 1955 by William H. Markwood, Jr., Wilmington, Del., and George M. Taylor, Kenneth Square, Pa., assignors to Hercules Powder Company, Wilmington, Del., a corporation of Delaware.

The wire conductor is coated with a tough and flexible plastic coating essentially comprising a polymer of the group consisting of homopolymers of 3,3-bis(chloromethyl) oxetane, copolymers of 3,3-bis(chloromethyl) oxetane with other 3,3-disubstituted oxetanes, copolymers of 3,3-bis(chloromethyl) oxetane with oxetane itself, or copolymers of 3,3-bis(chloromethyl) oxetane with other substituted oxetanes, and the polymer having a specific viscosity of at least about 0.3, when measured as a 1% solution in cyclohexanone at 50°C.

★ ★ ★

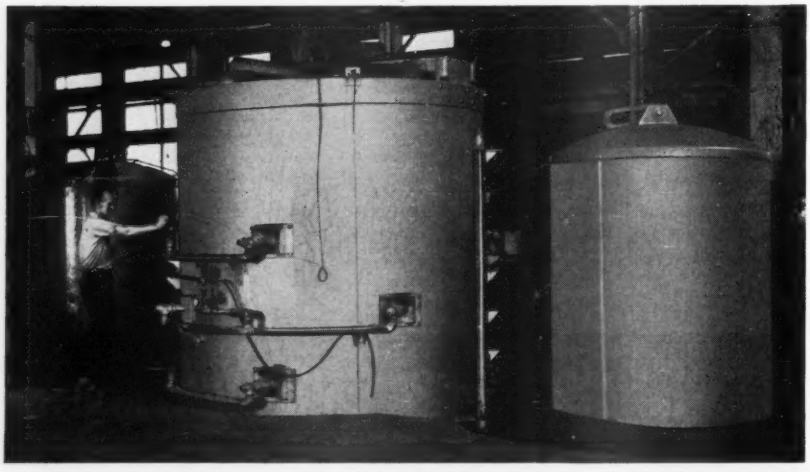
No. 2,722,562, ELECTRIC CABLES, patented November 1, 1955 by Edward E. McIlveen, Upper Montclair, N. J., assignor to The Okonite Company, Passaic, N. J., a corporation of New Jersey.

A cable is disclosed in which the insulated wire conductor is provided with an electric cable comprising an insulated conductor; a layer of non-metallic bedding tape; a flexible metallic longitudinally corrugated barrier tape about the bedding tape; and an outer, non-metallic, rubber-like flexible sheath structure; and the tape being helically wrapped about the bedding tape with the material of the bedding tape filling the corrugations on the inner face of the barrier tape and with a number of the corrugations of one turn of the barrier tape interlocked with a number of the corrugations of the next turn, the barrier tape being bonded to the outer, non-metallic sheath structure and unbonded to the bedding tape.

★ ★ ★

No. 2,722,963, MANUFACTURE OF INSULATED ELECTRIC CONDUCTORS, PATENTED November 8, 1955 by James Alexander McCleery, Sale, England, assignor to British Insulated Callender's Cables Limited, London, England, a British company.

The method of manufacturing an electric conductor comprising one or more wires insulated by powder enclosed in a metal tube comprises assembling a conductor in a metal tube, sealing the latter and removing the air therefrom and from a confined volume of insulating powder, charging the metal tube and the confined volume of powder with a gas under pressure, other than air, and thereafter charging the tube with the powder and tamping the latter around the conductor.



Bright Annealing Wire Uniformly in ROCKWELL BELL FURNACES

In this Rockwell installation four furnace bases and one gas fired, bell type furnace provide the required operating flexibility of heating, loading and unloading the work. Each base is equipped with a circulating fan to distribute heat uniformly to the charge.

A steel hood is placed over the work and sealed tight. The load of copper product is bright annealed in a protective atmosphere and cooled in the hood.

ROCKWELL ALSO BUILDS
Batch and continuous furnaces and ovens for annealing, aging, drying, enameling, tinning, glass coating, synthetic coating. Atmosphere generators.

Rockwell bell furnaces (cylindrical or rectangular) are built to specifications for bright annealing steel and non-ferrous wire in coils or on spools.

Write for Bulletin 432 on Rockwell Wire Mill Furnaces.

ROCKWELL SINCE 1888 BUILT

W. S. ROCKWELL COMPANY
FURNACES • OVENS • BURNERS • VALVES • SPECIAL MACHINERY
2426 ELIOT STREET • FAIRFIELD, CONN.
Sales Representatives in Principal Cities

No. 2,723,525, WIRE TWISTING MACHINE, patented November 15, 1955 by Sidney B. Blaisdell, East Greenwich, R. I., assignor to Edmands Company, a corporation of Rhode Island.

This machine comprises a flyer section, a rotatable tubular shaft at one end thereof and within which a wire strand passes relative to the flyer section, a guide for the wire strand extending into the shaft and having a number of rotatable rollers thereon engageable by the strand as passed through the guide, the rollers being relatively closely spaced and mounted on centers which are positioned on a relatively large arc.

★ ★ ★

No. 2,723,926, METHOD OF WINDING A TUNGSTEN COIL ON AN IRON MANDREL, patented November 15, 1955 by Emile Melvin Bellott, Cedar Grove, N. J., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania.

The method comprises electrolytically cleaning tungsten wire to remove surface contaminants therefrom, winding the clean tungsten wire on an iron mandrel; degreasing the wound coil, annealing the coil in wet hydrogen at about 850°C. to remove all stresses and strains therein, cutting the wound coil to length, baking the annealed coil in wet hydrogen at about 850°C. for approximately 10 minutes to set the coil structure about a straight axis with uniformly spaced turns to insure uniform length and to remove absorbed gases therefrom.

★ ★ ★

No. 2,724,165, ANCHOR FOR CONCRETE FORMS, patented November 22, 1955 by Chester I. Williams, Grand Rapids, Mich.

This structure is formed of an elongated bar-like member having a shank and a number of prongs extending from the shank. The member is provided with a number of indulations.

★ ★ ★

No. 2,724,415, COIL WINDING MACHINE, patented November 22, 1955 by Henry C. Orth, Bellerose, N. Y., assignor to Sperry Rand Corporation, a corporation of Delaware.

A coil winding machine is disclosed in which successive coils are wound in the helical grooves of rotating spindles.

★ ★ ★

No. 2,724,422, WIRE STRAIGHTENING MACHINE, patented November 22, 1955 by Walter Siegerist, Richmond Heights, Mo., assignor, by mesne assignments to Continental Foundry & Machine Company, East Chicago, Ind., a corporation of Delaware.

The machine comprises a rotatably mounted carrier casing, a number of longitudinally spaced offset dies in this casing, the surface of the bore through the dies being a hyperboloid of revolution, a device for rotatably supporting the dies in the casing with the axes of the bores parallel, the device being disposed at an angle to the major dimension of the casing: and a device for varying the offset spacing between the dies at right angles to windsheaf line of the hyperboloid of revolution so that the angle of the intersection of the axes of rotation of the die and carrier casing is constant.

★ ★ ★

No. 2,724,561, CONTROL DEVICE FOR STRAND FEED, patented November 22, 1955 by Karl H. Andren, Greenfield, Wis., assignor, by mesne assignments to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Means is provided for preventing the passage through the machine of a wire strand containing a knot detected by the machine.

★ ★ ★

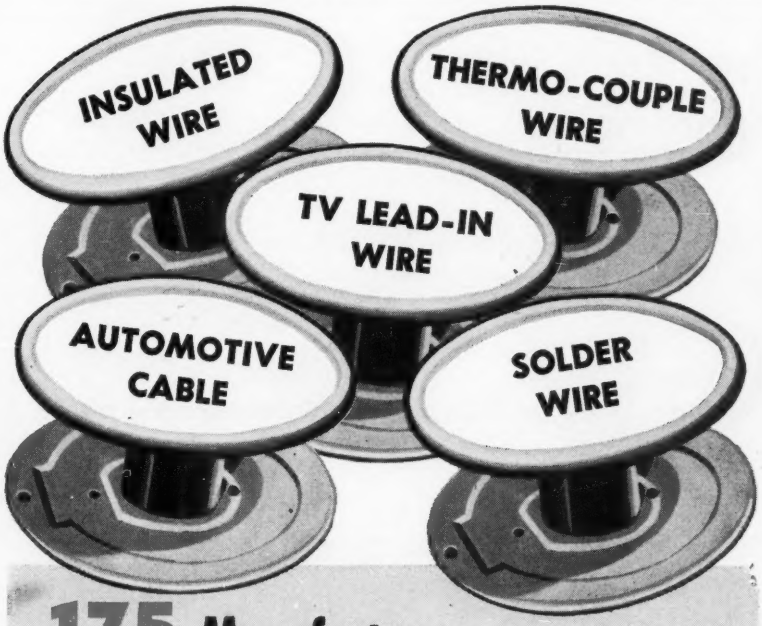
No. 2,724,591, LOUVER WIRE FEEDING DEVICE, patented November 22, 1955 by Robert A. Christy, Park Forest, Ill., assignors to Borg-Warner Corporation, Chicago, Ill., a corporation of Illinois.

This is a device for controlling the supply of wire maintained in a storage bin by feeding means for feeding the wire into the bin either at a high rate or a low rate.

★ ★ ★

No. 2,724,671, FRICTION ELEMENT AND METHOD OF MAKING THE SAME, patented November 22, 1955 by Frank Lombardy, Somerville, N. J., assignor to Johns-Manville Corporation, New York, N. Y., a corporation of New York.

The element comprises crimped wire-



175 Manufacturers say MASON Spools are best—for less!

These manufacturers specify Mason lightweight, non-returnable, lithographed Spools for performance, appearance and cost!

And while Mason Spool performance speaks for itself, the appearance of Mason Spools speaks for *you* with rich, colorful lithography that assures *instant brand recognition.*

Mason lightweight, non-returnable Spools are available in 5″, 6½″, 8½″ and 10½″ head sizes. All sizes are available with 1⅞″ (Dia.) barrels. The 10½″ head size is also available with a 3½″ (Dia.) barrel. Barrel lengths from ⅝″ to 14″.

Let us know about your spool requirements *now!* Telephone East Providence 1-2810 or write to the address below.

MASON CAN COMPANY

1949 Dexter Road, E. Providence 14, R. I.

Branch Plant — Greenville, Ohio

reinforced fiber yarn disposed in convolutions defining a disc, the yarn being held in the form of the disc by a hard, cured binder matrix.

★ ★ ★

No. 2,724,842, INNERSPRING MATTRESS, patented November 29, 1955 by Max Rogovy, Akron, Ohio.

A furniture spring unit is disclosed which includes in addition to the conventional spring, auxiliary springs supported by the usual springs, and means for vertically adjusting the top of one of the springs with respect to the top of the other.

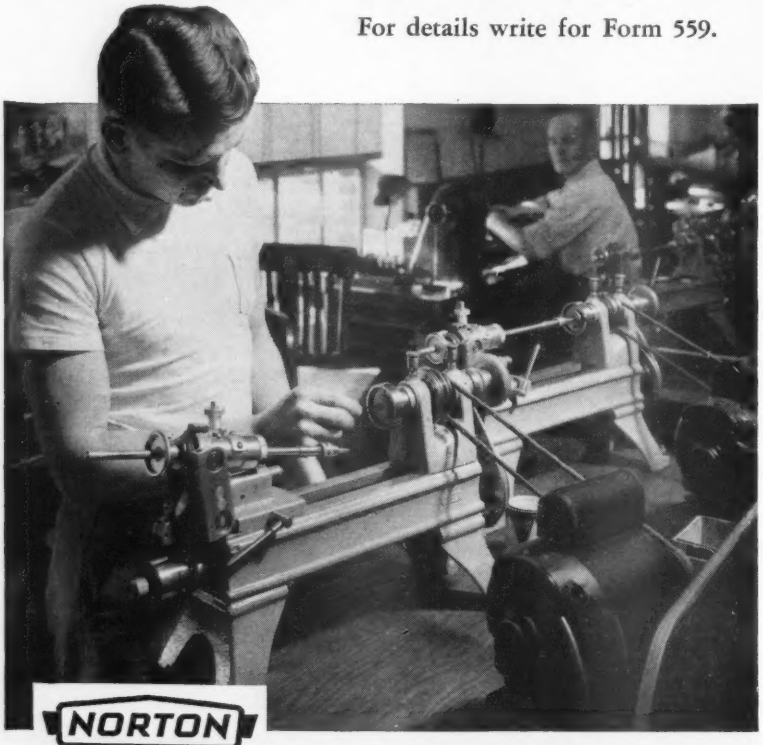
No. 2,724,944, APPARATUS FOR MAKING STRANDED WIRE STRUCTURES, patented November 29, 1955 by Dana B. Carleton and John E. Pritchard, Trenton, N. J.

Included are a rotary closing die assembly in a die housing disposed coaxially relative to a rotary twisting machine, means connected with the die assembly for driving the same at an angular velocity equal to that of the machine, and means for disengaging the die assembly from a driving means.

Save Money with NORBIDE® Abrasive . . .

Are you still using costly diamond dust for refinishing your wire drawing dies? Many wire mills are saving money by using NORBIDE Abrasive for ripping or fast stock removal as well as for accurate semi-finishing operations.

For details write for Form 559.



NORTON
BORON CARBIDE

NORTON COMPANY
45 New Bond Street • Worcester 6, Massachusetts

NORBIDE® . . . *the hardest man-made abrasive*

Midget Part Activates Complex Business Machine

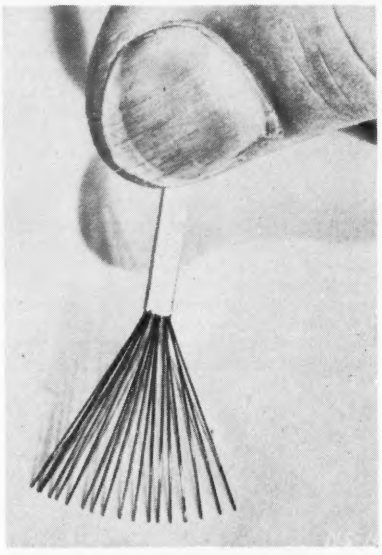
The wire brush shown here with strands spread apart, plays vital role in the operation of intricate business machinery.

★ ★ ★

In electrical computers, these wires make contact with holes in punched card, and upon proper register, activate the machine to record the desired information.

★ ★ ★

Drawing of the wire during production and the reduction of diameter between heat treatments are very closely controlled to ensure absolute uniformity together with toughness, smooth surface and perfect straightness. It is a tempered music spring wire, with a tensile strength of 300,000 psi



and is drawn to .008, with a size tolerance of .0002″ minus and .000″ plus.

★ ★ ★

Minute in size when compared with the machine it activates, the brush consisting of the steel jacket and the 18 strands of wire, measures only 2-1/2 inches in length, is less than 1/16 of an inch thick and 1/4 of an inch in width.

★ ★ ★

This wire, used in fabricating the contact brushes, is made by the **Worcester Wire Works Division of The National-Standard Company**, Worcester, Mass.

New Stainless Steel With Little Nickel Announced

A new grade of stainless steel containing little or no nickel was described in a paper read before the Cleveland Regional Technical Meeting of the **American Iron and Steel Institute.**

★ ★ ★

Dr. Dennis J. Carney, author of the paper, is superintendent of No. 2 electric furnace department at U. S. Steel's South works in Chicago, Ill. A patent application has been filed on the new product which was developed through studies aimed at conserving nickel, currently in short supply.

★ ★ ★

According to the author, more nitrogen is used in the nickel-free and low nickel stainless steels than was thought possible prior to the study. He asserted that by the proper adjustment of the chemical composition of the steels—particularly with regard to the chromium and manganese contents—sound ingots can be made with a nitrogen content of more than double the old limit.

★ ★ ★

"This discovery opened the door to an entirely unexplored area for a reduction in the use of nickel," he said.

★ ★ ★

Continuing the disclosure of the results of his studies on nickel-free stainless, Dr. Carney concluded, "Further work is necessary to establish more carefully the corrosion, welding and high-temperature properties of these high-nitrogen steels.

★ ★ ★

"It is also necessary to solve several rolling and finishing problems. It is expected, however, that these problems will be resolved in the near future. If so, the way may be opened to a further marked increase in stainless steel production and application. A new grade of austenitic stainless steel has been developed with special fields of application and not merely as a substitute for presently used grades during periods of nickel shortage."

To Produce Low-Pressure Polyethylene

Union Carbide and Carbon Corporation has concluded an agreement with **Phillips Petroleum Company** for a license under the Phillips patents involving low-pressure polyethylene, according to **George C. Miller,** President of Union Carbide's Bakelite Company. Under the agreement, Carbide has rights to produce polyethylene of the general types presently identified by the Phillips trade-mark "Marlex."

This polyethylene is a high-strength, semi-rigid, thermoplastic that may be processed on standard equipment to make pipe, housewares, film, bottles and electrical insulation. Although the material is of the same general type, it presently differs somewhat in certain properties from low-pressure polyethylene obtained by the Ziegler Process, under which Carbide is also licensed.

★ ★ ★

Polyethylene produced by the so-called low-pressure Phillips or

FROM—PLYMOUTH CORDAGE CO.
PLYMOUTH, MASSACHUSETTS
TO—THE WIRE INDUSTRY
Plymouth offers you PLYMKRAFT improved cable filler to your precise specifications. Made to fine tolerance, always uniform, this improved type of twisted paper is available in the exact put up that works best on your equipment, with any type treatment applied —wax, jute saturant, anthracene. Keep up to date on cable filler developments. For samples of PLYMKRAFT write to Plymouth, makers of fine cordage products for over 130 years.
PLYMKRAFT DIVISION
Plymouth Cordage Company
Plymouth, Massachusetts
New Orleans, Louisiana
Warwick, Virginia
PLYMOUTH
1824
PLYMKRAFT DIVISION

Ziegler techniques differ markedly from the conventional high-pressure polyethylene in strength, stiffness, distortion point and vapor transmission.

★ ★ ★

Bakelite Company has thoroughly surveyed the potential market for the newer low-pressure polyethylenes. These materials when readily available are expected to have some effect on markets presently served by high-pressure process polyethylene.

Cleveland Crane Offers Aluminum Inverted-Y Conductors For all Makes of Cranes

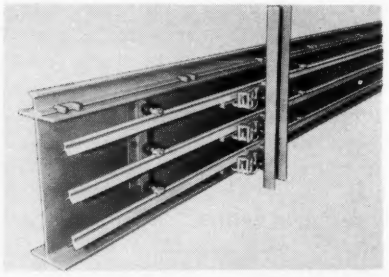
Aluminum "Inverted-Y" Conductors with especially engineered sliding shoe collectors to handle heavy current requirements of overhead traveling cranes are now being offered for general application for the first time by **The Cleveland Crane & Engineering Co.**, Wickliffe, Ohio.

★ ★ ★

The conductors are heavy aluminum extrusions, available in 300, 500, 1000 ampere and larger sizes. They may be either side-or overhead-mounted to crane girders or runways by hangers especially made to permit the conductors to float. This obviates the need of expansion joints and eliminates strain on the insulators, thereby minimizing their breakage.

★ ★ ★

The current collectors are extra heavily built to give long trouble-free service on hard-duty applications, such as are common in steel mills, foundries, etc. They are provided with a counterweight which maintains constant pressure of the sliding shoes on the conductor bar.



Here are illustrated three Cleveland Crane Aluminum Inverted-Y Conductors side-mounted to a runway beam. Under-running shoes in pantograph-type current collectors maintain positive electrical contact regardless of conductor bar irregularities.

Each collector has two shoes which assure uninterrupted current flow. The shoes are in tandem and can be easily replaced by loosening one stud bolt for each. Because of pantograph motion and a ball and socket connection at the shoe support, positive contact will be maintained even if a bar becomes misaligned in either the horizontal or vertical plane.

★ ★ ★

Although Inverted-Y electrification has been used on Cleveland Cranes since 1948, this is the first time it has been offered for application on all makes of cranes and runways. The conductors, collectors and necessary fittings will be furnished for installation by the purchaser.

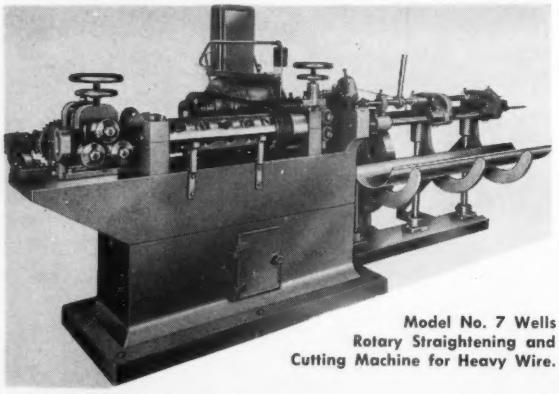
★ ★ ★

Inverted-Y electrification assures full power delivery and is a

A Fast, Dependable Wells

STRAIGHTENER AND CUTTER FOR HEAVY WIRE

Shown below is the famous Model No. 7 WELLS ROTARY STRAIGHTENING AND CUTTING MACHINE designed for a maximum of durability and service.



Model No. 7 Wells Rotary Straightening and Cutting Machine for Heavy Wire.

Flyer runs in ball bearings. All wear parts made of tough steel for long, trouble-free operation.

Motor and gears are readily accessible.

A highly satisfactory machine for day-in, day-out production.

This machine is designed to handle 1/4", 5/16", 3/8", 7/16" and 1/2" wire at speeds of 90' to 100' on long continuous production runs. Other WELLS MACHINES are made to handle smaller gauges of wire at correspondingly higher speeds.

Backed by 59 years of experience and development

Send for Catalog covering the full line.

Frank L. Wells Company

KENOSHA • 5821 Fifth Avenue • WISCONSIN

Builders of Fine Wire Working Machinery

definite aid for preventing production hold-ups. It will greatly reduce electrical maintenance requirements.

Carboloy Announces New Ceramic for Cutting Metal

At the National Metal Congress in Philadelphia, the **Carboloy Department of General Electric Company,** Detroit, disclosed a new ceramic material with outstanding characteristics as a cutting tool tip.

★ ★ ★

Normally such materials, while very hard, have been too brittle for cutting applications, but Carboloy engineers have succeeded in imparting to it a slight degree of ductility, sufficient to give it the strength needed for this rugged work.

★ ★ ★

The new ceramic, which has been laboratory and field tested, has demonstrated that it has many times the life of carbide tips, but enables the cutting to be done at surface speeds up to 7500 FPM. Naturally, the depth of the cut bears a direct relation to the speed of cutting.

★ ★ ★

On some tests the tool life has been found to be more than 25 to 1 over the carbides employed on the same job. This cemented oxide material has another unusual characteristic—it does not become hot. On a severe cutting job, it was shown that the tool could be held in the hand after a long cut.

★ ★ ★

Other applications for the new material have been indicated, but not as yet worked out. It is expected that the new ceramic will be available in limited quantities by the first of the year at prices that will make it economical to use.

Fork Truck Attachment for Drum Handling

Marvel Industries, Inc., 2224 Cleveland St., Evanston, Ill., announces a new fork slide-on mounting for the Liftomatic Power Truck Attachment, which eliminates the necessity of removing the forks when handling drums. Fabricated to any size fork dimensions, the mounting can be made to accommodate from one to three Liftomatic units. The units can be permanently spaced for fixed diameter drums, or mounted so as to be adjustable for drums of various diameters. The mounting is picked up in the same manner as a pallet, by entering the forks into the slots, and no fastening devices are used. Details upon request.

New Tramrail Engineering Booklet

A new completely revised Engineering and Application Booklet has been issued by the **Cleveland Tramrail Division** of **The Cleveland Crane & Engineering Co.,** Wickliffe, Ohio.

★ ★ ★

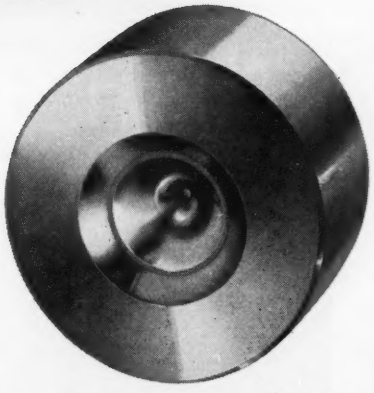
The booklet describes in considerable detail stresses developed in various type tracks used for overhead materials handling systems. The problem of track peening and its solution is also covered.

★ ★ ★

Data is given on the principal components used for Tramrail Systems. Many illustrations show the equipment serving a wide variety of operations.

WILLEY'S
TUNGSTEN CARBIDE

METALS
DIES
TOOLS
for the Wire Industry



Rough Cored Standard Dies
(from stock)
ROUND SQUARE HEXAGON OCTAGON

Rough Cored or Finish Ground
(Immediate quotations on receipt of your prints—
Fast delivery schedules)
SPECIAL DIES WEAR PARTS MANDRILS
NIBS—HEADING AND EXTRUSION DIES

For complete information:

Willey's Carbide Tool Co.
1340 W. VERNOR HWY. • DETROIT 1, MICHIGAN

The 12-page booklet, No. 2008-L, will be furnished gratis by writing the company.

Circle W. & C. Sold to Cerro de Pasco Corp.

Stockholders of **Circle Wire & Cable Corporation,** Maspeth, Long Island, at a special meeting, in November, approved liquidation of the corporation and sale of its business and assets to **Cerro de Pasco Corporation** for $20,250,000.

★ ★ ★

The transfer of title to the corporation's business and assets was effected December 1, 1955. Thereafter, the Circle enterprise which consists in the manufacture and sale of the principal types of insulated wire and cable will be carried on by a wholly-owned Cerro de Pasco subsidiary. This subsidiary, incorporated recently in Delaware, bears the same name as its predecessor.

Bulletin on Aluminum Heat Treating Furnaces

A new technical bulletin describing furnaces for the heating and heat treatment of aluminum and other light metal alloys from the ingot to the finished product has just been issued by **Surface Combustion Corporation.**

★ ★ ★

This bulletin covers all types of furnaces, both batch and continuous, including soaking pits, coil annealers, continuous process roller hearth furnaces, batch type units for heat treating, and melting, as well as investment casting. Important new data on extremely rapid heating with high speed convection are presented in the section "Forecasts of Furnace Performance," on page 8.

★ ★ ★

Copies are available on request to Surface Combustion Corporation,, Toledo 1, Ohio. Ask for bulletin SC-171.

Titchener Expands Facilities

E. H. Titchener and Company, manufacturers of welded wire assemblies, have announced the latest additions to their plant facilities in Binghamton, N. Y. Major expansion made in Titchener's plating and finishing department will also extend the design services offered by the company's complete sample-making laboratory.

★ ★ ★

Newest installations include an electropolishing process for finishing stainless steel wire forms and assemblies; also strip metal parts; and a plastisol dip operation for black or white coating of wire assemblies such as furniture chair backs, hospital equipment, leather working racks, and holding devices for glass and ceramics.

★ ★ ★

Other additions are equipment for plating wire products in brass, copper, black Ebonal, and satin zinc. Brass or copper plating is

NIEHAUS WIRE STRANDING ROPE CLOSING CABLE MAKING **MACHINES**

45 SPOOL

High Speed Stranding Machine

for stranding Seale, Warrington and fill-wire type ropes.

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DÜSSELDORF-RATH

added over a bright nickel plate and finished with an abrasion-resistant lacquer.

★ ★ ★

The production capacity of the metal stamping department has been enlarged with a new 70-ton capacity press. Installation of a spiral winding machine greatly increases the design versatility of Titchener's wire forming and wire assembly department.

Steelweld Press Brake Catalog

A new catalog describing "Steelweld Press Brakes" has just been issued by **The Cleveland Crane & Engineering Co.,** Wickliffe, Ohio.

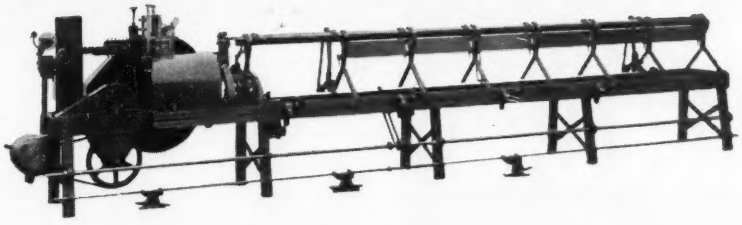
★ ★ ★

Construction details are described and illustrated. Dimensions and specifications are given for the entire standard line of Press Brakes which range in bending capacity to 14′ x ¾″ mild steel.

★ ★ ★

Catalog No. 2010-H will be sent free on request.

DOWNEY Single Loop Bale Tie Machine



FAMOUS FOR GENERATIONS

in production of long oval or old-fashioned round loops!

Designed for easy one-man operation

Capacity: 2000 Bale Ties per hour

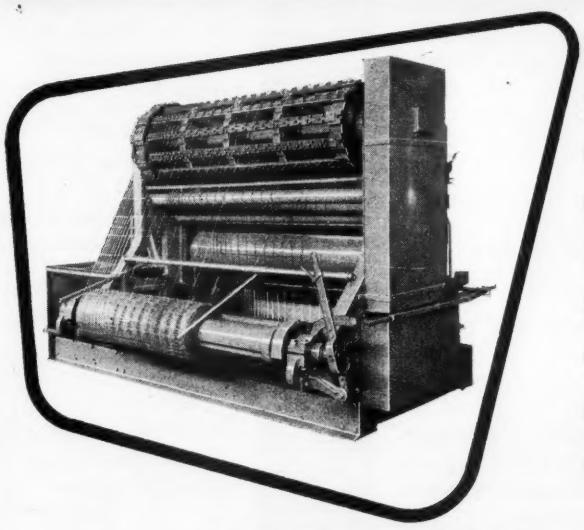
- TIE LENGTHS: 5 to 15 feet. WIRE GAUGES: #12 to #16. Equipped with Master Unibrake Motor and Controls.
- Machine straightens wire, cuts to length, twists loop and counts finished ties at the rate of 35 per minute.
- Bundler equipment is conveniently attached to machine to spiral-wrap finished ties into bundles of 250 each.
- One man operating 1 or 2 machines completes entire manufacturing from putting wire on feed reel to taking finished bundle of bale ties from Bundler Attachment.

distributors:

SEYBOLD TRANSWORLD EXPORTERS

122 East 42nd Street, New York 17, N. Y. (USA)

Interlocking FENCE LOOMS



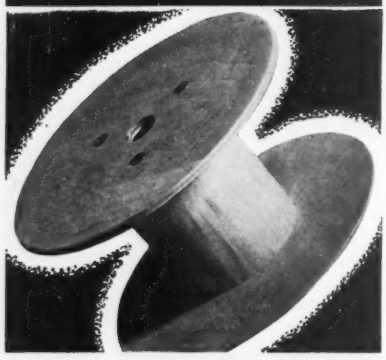
- Fastest — Most Efficient
- Preferred by Leading Mills
- Low Maintenance Cost
- Wrapped Stay Fence
- Straight Stay Wires
- Integrated — Space Saving
- Replaceable Main Bearings
- Single or Double Strands
- Years of Low Cost Production

Write for Detailed Information — Without Obligation

Interlocking Fence Co., Box 8, Morton, Ill.

Specialists In Fence Looms

PROVEN BY THEIR RECORD



Leading manufacturers all over the country choose Carris reels and continue to do so, due to their record. They're all plywood, light and strong, and moisture resistant. Custom-built to your particular requirements, they're produced by straight-line methods, assuring economical costs and quick delivery. Let us quote on your requirements. Write us today!

SAY "CARRIS" BECAUSE

- √ THEY'RE ALL PLYWOOD
- √ THEY'RE QUALITY-CONTROLLED
- √ THEY'RE MADE BY VERMONT CRAFTSMEN
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RETURNABLE ■ NON-RETURNABLE

PLYWOOD REELS AND SPOOLS

70 PARK ST. RUTLAND, VT.

Tel. PRospect 3-7388

Quick Reference Pocket Guide For Carbide Tools Offered

Metal Carbides Corporation, Youngstown, Ohio, manufacturers of Talide Tools, is offering a Quick-Reference Pocket Guide to better use of Talide Metal.

★ ★ ★

Produced on a sturdy piece of laminated plastic, the Talide guide presents recommended grades, type of cut and cutting speeds of Talide Metal for machining various materials, from Cast Gray Iron to plastics, asbestos, fibre, rubber, glass and mica.

★ ★ ★

In addition, there is an easily read chart indicating the Rake and Relief Angles for Talide Metal Turning Tools as applied to various materials.

★ ★ ★

On the reverse side, a chart shows the suggested speeds, feeds and depths of cut for machining steel with Talide Metal Turning Tools. Chip Removal Applications, Wear Applications and Impact Applications of Talide Metal are also presented in chart form.

★ ★ ★

To receive one of these informative Quick-Reference Talide Pocket Guides, send requests to Metal Carbides Corporation, Youngstown, Ohio.

Beryllium Buys Copper Wire Firm

The Beryllium Corporation has announced acquisition of the capital stock of **Nonotuck Mfg. Company** of Holyoke, Mass., effective December 3, 1955.

★ ★ ★

In a letter to stockholders, **Matthew J. Donachie,** president of the Beryllium Corporation, which manufactures beryllium metal and its alloys, described the acquisition as part of the firm's long-range program to expand and diversify activities.

★ ★ ★

The diversification program, he said, has been under active consideration by the company's board of

ANACONDA® copper and copper alloy WIRE in all Commercial Tempers and Sizes including Round, Flat, Hexagonal and Special Shapes.

WIRE FOR SPECIAL PURPOSES

Copper, Brass, Bronze, Everdur and Nickel Silver in special grades for the manufacture of rivets, nails, pins, piano hardware, etc. Fine Wire on spools.

RESISTANCE WIRE

Nickel Silver.

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Bronze (Antique Golden), Brass, Nickel Silver, Everdur*, Phosphor Bronze, Copper and Fourdrinier Wire.

SPRING WIRE

Brass, Phosphor Bronze, Everdur.

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WHAT'S IN A SLOW BURN?

There's more to a slow burn than just temper.

When radio or TV hook-up wires get crossed, there may not always be sparks but there's a lot of heat generated — sometimes enough to start a good flame on the insulation.

When this sort of thing happens, the flame can be retarded and even extinguished if a NELCO saturant has been used on the insulation. Our laboratories worked long and hard to discover just the right combination of materials that would give a fire-retardant saturant that would also meet all other requirements of the radio and TV hook-up wire people.

The NELCO saturant we have developed, besides its outstanding characteristic of being a fire-retardant, has many other fine qualities. For example:

Its lightness in color makes wire more attractive, more sellable.

Its resistance to discoloration means finished wire that will not fade or become untraceable.

Its quick-drying properties, essential in mass production operations, are unequalled.

Here is another NELCO saturant, specially developed to do a tough job . . . as are all our saturants and lacquers.

When you do a slow burn over inefficient saturants, write to us for help. We're used to finding just the right solution for other people's problems.

Chemical Products
CORPORATION
King Philip Rd., East Providence, R. I.

directors and management for the past several years.

★ ★ ★

Nonotuck sales run about $2 million annually. This firm's principal business is drawing, tinning and bunching copper wire.

★ ★ ★

Nonotuck will retain it identity with management and manufacturing operations continuing as before.

★ ★ ★

Principal officers of the corporation, chartered in 1937, are its two founders—**Howard H. Allen,** president, and **Frederick P. Barrett,** treasurer. Nonotuck has production facilities capable of drawing 5/16th inch copper rod to wire as fine as five-thousandths of an inch.

Diamond Facts

"What You Should Know When Buying and Using Diamond" is the title of Booklet No. 1 in the diamond series, just published by the **Abrasives Division** of **Elgin National Watch Co.,** Elgin, Ill.

★ ★ ★

The booklet gives information in various chapters on sources of diamonds, their hardness, cutting ability when used as abrasives, characteristics of good diamond powder, and how to make tests for quality.

★ ★ ★

Any user of diamond powders or diamonds in other industrial forms will find the booklet highly instructive. You are invited by the company to send for a copy.

Wire Firm Moves

Anthony J. Randazzo, President, **Randy Wire Works, Inc.,** has announced the removal of the company's plant from Midland Park to 722 Liberty Ave., North Bergen, N. J.

★ ★ ★

The company processes specialty wires, drawing steel and stainless steels to fine wire sizes.

FOR
EXTRA TONNAGE
FROM YOUR BAR STOCK AND WIRE DIES

COAT WITH
BORAX 5 MOL.

Borax and Borax 5 Mol Offer Many Advantages as a Coating Material

Here is dust-free, granular material that is readily soluble in water and dries quickly. The residual film is tight yet pliable... won't flake off! Borax is safe to use, easy to handle, and non-irritating to the skin. You can feed stock faster and you get longer, more accurate performance from your dies.

Check these advantages of borax-coated stock:

- COMPATIBLE WITH DRAWING LUBRICANT
- BETTER WORKING CONDITIONS
- FASTER BUTT WELDING
- LONGER DIE LIFE
- LONGER STORAGE SAFETY
- CLEANER TO HANDLE IN TRANSIT

Write for Technical Data Sheet #2 WD

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DIVISION OF BORAX CONSOLIDATED, LIMITED
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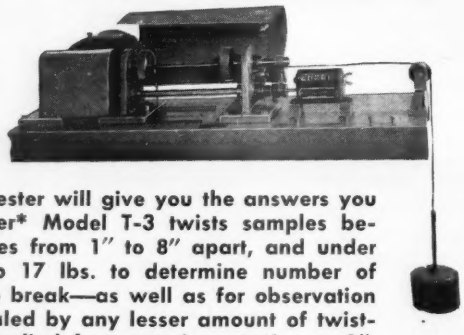
MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS

TESTED IS TRUSTED

BRITTLENESS
POOR FORMING
FAULTY ADHESION OF PRECIOUS METAL
SEAMY

Are you currently facing these problems in your wires?



Perhaps this Torsion Tester will give you the answers you need. This Scott Tester* Model T-3 twists samples between gripping surfaces from 1″ to 8″ apart, and under tension of from ½ to 17 lbs. to determine number of revolutions required to break—as well as for observation of characteristics revealed by any lesser amount of twisting. Mandrels are supplied for preparing specimens 2″, 4″ or 8″ in length.

*Trademark

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ELEVATOR and AIRCRAFT CABLE SHIELD
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WIRE COATINGS

COPPER • ALLOYS • ALUMINUM

Our experienced staff of lubrication engineers is available for consultation without charge. Write us regarding your special lubrication problems. The Ironsides Company, Columbus 16, Ohio.

SHIELD PRODUCTS

Ironsides

Makers of Palmoshield • "the palm tree that grows in Ohio"

Symposium

(*Continued from page* 57)

way of process materials there is a point where the efficiency of the plant is well impaired because it is too cluttered up or because it is waiting for material. There is that point at which it operates most efficiently and that, as I see it, is an individual plant situation.

As far as finished goods is concerned it is as little as you can get away with when you are not selling.

Question: We are hearing more and more about this sales forecasting and I would like to have an opinion from the panel members as to just what they think of it — how accurate do they think it is?

Mr. Sanderson: That is something rather difficult and a lot of it naturally depends upon business trends. If you recall, four years ago we had a little cutback and it was hard. Everything was down and stocks were well built up. Then we went into a prosperous two years and things began to hum. I know that these sales departments do have difficulty in making forecasts and I think that one of the things that you have to do is to have these customers take the responsibility of your holding some inventory for them. That will give you some flexibility and latitude in maintaining your inventory. Of course, that will also cost you some money.

Mr. Girdler: When you are talking about this sales forecasting, you also have to take into consideration the fact that these larger companies employ outside opinion research to give us a forecast of what they think the business trend is going to be based on. We get a lot more information that way than we can pick up through our own channels.

Mr. Hackley: I would like to add that this is something that we do not take lightly for our commercial research people are sifting every last bit of information available. Outside sources are contacted and people travel around and bring back information. All of this is then combined when a forecast is attempted. In general, forecasts are no easy matter.

Comment: We have heard a lot about scheduling in these large plants but I would like to say that in our case we schedule at the mill level and in that respect we think that we do a good job in meeting our promises.

Mr. Moritz: It could also be that the problem would vary from one mill to another depending upon the type of delivery that their sales department is able to give.

Question: I wonder if some of the equipment men could give us their idea and thoughts on the cost of a good inventory and a production control system in rough percentage of cost of sales or something of that sort.

Mr. Morse: I think that is wide open for if you are talking about production control then there are too many elements which involve production control and which may not be in that department. I don't think you can answer it because there are so many variables in it.

Question: I would like to ask a question of our machinery people. If I were in business selling one size of nail and all I had to do was to buy this one size of nail and sell them to the people who wanted them, then I don't suppose it would be hard to keep an accurate in-

ventory and record of supply and demand. However, with the modern speedy electronic equipment coming out, is that expected to make business simple for an item such as that?

Mr. Wilbur: I will answer it in this way. For the little fellow who is dealing with one item, nine chances out of ten the individual would be able to control the inventory by simplified means and not have any problem. However, as business grows and the lines spread out, management gets more and more away from the detail problems and this then is where record-keeping equipment comes into being. It is scaled in all sizes, all ranges and all costs. We believe that we are rapidly approaching the area where a lot of these questions, the whole over-all program, will be integrated into one record-keeping system and in most cases the men involved in the record-keeping areas will be better applied to more efficient methods of doing and creating work. We feel that you can save money by using these new record-keeping techniques and at the same time free a man from minor work and put him into more responsible work.

Question: How long after you receive an order do you think it should take to get into your customer's hands the acknowledgement of expected delivery?

Mr. Hackley: From the time it left the customer's hand to the time that it got back in, I would say between one and two weeks.

Mr. Moritz: It looks like we have just about summed up the situation.

I think that what we are generally striving for is that we can get at our fingertips the information that we need as quickly as possible. As we have found out, there are various systems that we can use for that purpose.

[The meeting adjourned at 3:45 o'clock, P.M.]

Flood Damage and Rehabilitation Shown

The October issue of "Chase News", published by the **Chase Brass and Copper Co.**, 236 Grand St., Waterbury 20, Conn., gives many interesting pictures of the big flood in and about Waterbury, together with photographs of the state of certain equipment and corresponding photographs of the results of rehabilitation work, as it appeared in October. This issue, called the "Special Progress Edition", may be secured by writing to the company at the above address.

THE WIRE ASSOCIATION
invites wire men to join the organization and participate in its activities.
Write for a booklet on what it is and how it functions to
RICHARD E. BROWN
EXECUTIVE SECRETARY
453 Main St. Stamford, Conn.

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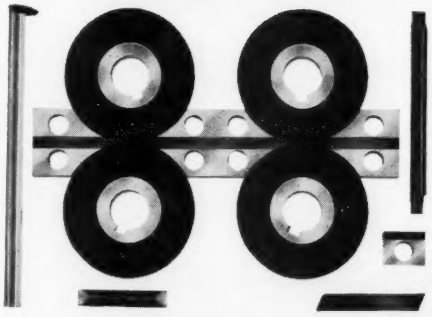

Spring coiling machine tools made of tungsten carbide will outlast steel — but unless the grooves FIT your wire ALL AROUND — you are *not* getting *maximum* life.

CRAFTS Carbide Tools are optically ground in special equipment of exclusive design. Grooves are *guaranteed* round and to size . . . to give *complete* support and uniform wear for longest life.

Depend on **CRAFTS** Tools for better springs . . . a quality name since 1928.

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for Complete Information and Price List on the CRAFTS *line*

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Gentlemen:
Please send me complete information and Price List on **CRAFTS** Tools.
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For the past ten years we have specialized in the compounding of Vinyl extrusion and injection molding compounds to specifications, or developing compounds for a specific use.

Underwriters' approved standard compounds are available in all colors for POT, T, TW, 80 Degree C, 90 Degree C and 105 Degree C wires. We also have a compound which will meet requirements of Military Specifications MIL-W-5086.

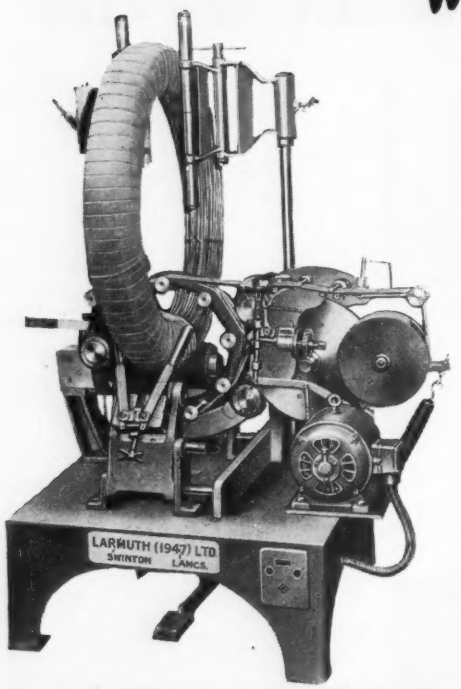
If you require a Vinyl compound rated higher than 105 degrees C for special applications, we suggest you communicate with us, as we may have a compound to meet your requirements.

Your inquiries are invited.

ELECTRONIC RUBBER COMPANY

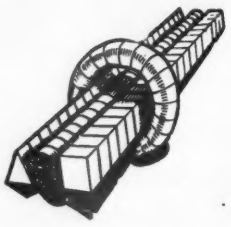
69 Sunnyside Ave. • Stamford, Conn.

LARMUTH *Spiral Wrapping* MACHINES



are built to finest British engineering standards and are in use throughout the world for spiral wrapping of Motor Tyres, coils of Wire, Strip, etc., from 3" bore upwards. Also straight length Tubes, Bars, Rods, etc.

"BOUND" to get there safely.



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TWISTING • STRANDING
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2231 E. ONTARIO STREET, PHILADELPHIA 34, PENNA.

Wire Assoc. Convention Story

(*Continued from page* 45)

PAUL A. NEHRING, Pres.
Nehring Electrical Works, DeKalb, Ill.
RAYMOND S. SIMMONS, Chief Metallurgist
Keystone Steel & Wire Co., Peoria, Ill.
EARLE H. THOMAS, Superintendent
George W. Prentiss & Co., Holyoke, Mass.
FREDERICK A. WESTPHAL, Division Mgr.
Sheffield Steel Division
Armco Steel Corp., Sand Springs, Okla.

★ ★ ★

Presentation of Certificates to the eleven Past Presidents of the Association was the pleasant task of **Richard E. Brown,** Executive Secretary. He explained that in the past 26 years, the Association had had 12 presidents, including Mr. Whitney, the current head of the society. He extended the thanks of the Association to these men for their work in furthering the objectives of the organization.

★ ★ ★

Certificates were presented to the following, whose terms of service follow their names:

John Mordica	**1930-1935**
Ralph K. Clifford	**1936-1937**
Frederick A. Westphal	**1938-1939**
J. Kenneth Beeson	**1940-1941**
Carl E. Johnson	**1942-1943**
D. Dwight Buchanan	**1944-1945**
Rowland M. Hussey	**1946-1947**
LeRoy D. Seymour	**1948-1949**
Fred M. Crapo	**1950-1951**
John A. Moritz	**1952**
Leonard C. Crewe, Jr.	**1952-1953**

★ ★ ★

John Mordica, Jr. accepted the certificate posthumously for his father, and similarly **John A. Moritz, Jr.** received the certificate for his father.

★ ★ ★

Mr. Brown closed his talk by saying: "It is a great honor to be asked to head the Association, but it would be an empty one if the office were not occupied by men of outstanding qualities of leadership and ability. We have been most fortunate in this respect and I am glad to say that every one of our Past Presidents has acquitted himself with distinction. We are deeply grateful to these men for

the fine quality of their leadership."

★ ★ ★

Following these presentations, President Whitney introduced the principal speaker of the day, **John H. Corson,** Manager of the Laboratory, **The Carpenter Steel Company,** Reading, Pa., who delivered the Mordica Memorial Lecture, entitled: "What Lies Ahead". This honorary lecture, perpetuating the name of **John Mordica,** the first president of the Association, was ably and interestingly presented by Mr. Corson. His lecture, which presented a number of thought-provoking ideas, appears in full in this issue of Wire and Wire Products.

The Annual Meeting of Members

President Whitney called this meeting to order at 4:00 P.M., November 16th, first calling upon Mr. Brown to read the minutes of the last meeting and to present the Treasurer's report. These were approved as read.

★ ★ ★

Mr. Whitney commented on the growth of Association from a handful of men in 1930, to 1164 as of October 1, 1955. He described the matters taken up by the Directors on the previous Monday and announced that for the forthcoming Regional Meeting next May **Stewart S. Gray,** Assistant Vice President, **Union Wire Rope Corp.,** Kansas City, Mo., had been appointed Program Chairman. For the next Annual Convention, he said, **Charles H. Williams, Jr.,** Superintendent, Wire Mills, **Pittsburgh Steel Co.,** Monessen, Pa., had been named to serve as General Program Chairman.

★ ★ ★

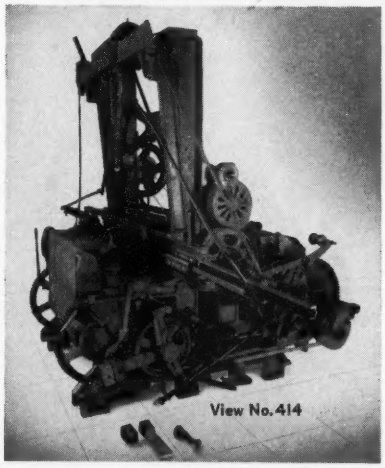
Discussion from the floor on the question of recording the discussions following paper presentations, resulted in varied points of view, for and against. No decision was arrived at, but the points raised will be considered by the Board at its next meeting.

★ ★ ★

A motion to place on the records the thanks and appreciation of the Association to the 1955 program

MEDIUM HEAVY WIRE LOOMS

No. 1548 MADE IN 48" AND 60" WIDTHS



Medium Heavy Loom No. 1548

FAST and EFFICIENT

Performs a wide range of weaving: from 1 to 60 meshes per inch, with gear let-off; 12 to 100 meshes or finer with ratchet let-off. Capacity is 6 mesh, .063" wire, or equivalent lathe beat-up resistances. Has cast iron warp drum, with steel spacing rings 2" center to center, 1/4" thick, with a warp drum winding attachment.

This loom has been redesigned and improved to provide better tension control. An electric automatic stop is furnished for when wire breakages occur. The looms are medium in weight. Approximately 16,000 lbs. for the 48" width and 18,000 lbs. for 60" widths. They are well-made, strong and rugged.

Write for descriptive literature on this or other type looms you may need.

MUMMERT-DIXON CO.

HANOVER 3, PENNSYLVANIA

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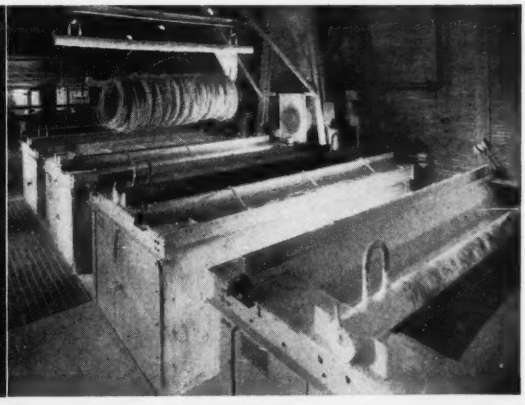
HI-SPEED REGISTERED **ROD BAKERS**



Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

Here are just a few of our many satisfied customers:

American Steel & Wire Co.
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B. Greening Wire Co., Ltd.
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Patent Nos.
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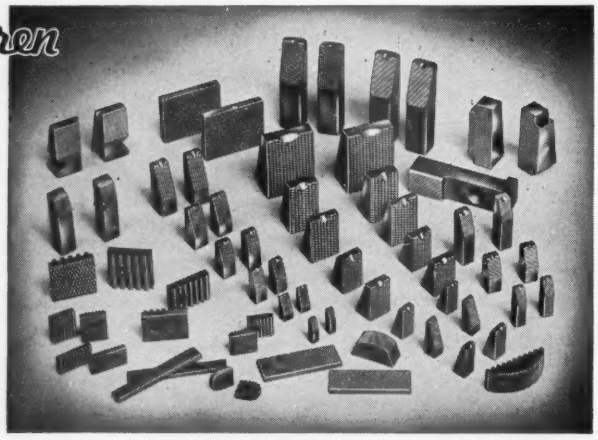

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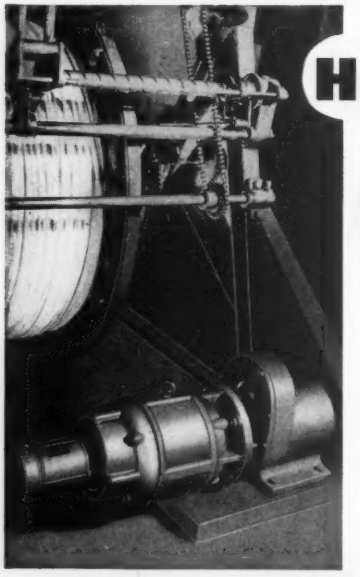


Hobbs-Alquist
WINDING ENGINEERED FOR WIRE MILLS

You can profit from Hobbs-Alquist winding Engineering if you wind ferrous or non-ferrous wire for spooling, respooling for further processing, for tension control of winding or for any other purpose! Hobbs-Alquist alone offers a complete line for winders and winding machinery and a complete winding engineering service.

Ask for the new Hobbs-Alquist Winding Engineering brochure . . . it completely describes and illustrates the winders, winding machinery and the engineering service.

Your First Step To Winding Savings !

HOBBS MANUFACTURING CO.
EST. 1883
35 Salisbury St. • Worcester, Mass. • DEPT. 370-5

chairman was unanimously adopted.

★ ★ ★

After a motion to ratify the acts of the Directors for the preceding year had been offered, seconded, and adopted, the meeting was adjourned at 5:15 P.M.

The Stag-Smoker Dinner

On Wednesday evening, 535 persons wended their way up to the Ballroom Floor. The cocktail bar opened at 6:30 P.M., and for the hour preceding dinner all were served with refreshments, during which time two performers entertained the crowd on a stage that had been erected behind and above the bar.

★ ★ ★

Doors to the ballroom were opened at 7:15 P.M. and in the next quarter hour the members and their guests found tables for the dinner which, incidentally, was very good.

★ ★ ★

The traditional vaudeville show, for which **Eber J. Hubbard,** President of **Hubbard Spool Co.,** Garrett, Ind., Chairman of the Entertainment Committee, was responsible, proved to be all that was expected and hoped for.

★ ★ ★

Mr. Hubbard, following the dinner, introduced a talented Master of Ceremonies, who kept things moving at a lively pace during the two-hour show that ensued. The acts had all been chosen with great care and an experienced judgement of what the men would enjoy. **Eber Hubbard** had arranged for a series of acts that went over in a big way, judging from the applause that followed each number. Thanks again, Eber, for a job skillfully done!

The Plant Inspection Trip

On Thursday, November 17th, 225 conventioneers left between 8 and 9 A.M. in busses for Waukegan, to visit the steel and stainless steel wire mills of the **American Steel and Wire Division of the United States Steel Corporation.**

★ ★ ★

Mills were established here in

1890 by the **Washburn-Moen Manufacturing Company**, producing mostly nails, fencing, barbed wire and wire netting for the Midwest farms. The plant underwent a gradual series of changes as it grew with the country, and became a part of The American Steel and Wire family in 1899. Today the plant is known as a "manufacturer's products mill" and is producing a great variety of wire for many industries.

★ ★ ★

The plant secures its wire rods from other AS&W units, and processes them into many products as well as supplying other mills with wire for re-drawing or wire product fabrication. Over 500 wire-drawing machines produce wire in sizes ranging from .75″ to .01″ in diameter. While the bulk of Waukegan's wire is dry drawn, certain types of fine wires and galvanized, bronze and copper-coated wires are wet drawn. This would include wire for screening, filters, springs and so forth.

★ ★ ★

In the visitors' passage through the Waukegan Works, they saw the departments that covered such operations as rod patenting, pickling, wire drawing, galvanizing, oil tempering, spring making, stranding, straightening and cutting, heat treating, coil bundling and the like. Guides were provided for groups of visitors and the tour routes were clearly marked. The operations were all on a huge scale and left their guests for the day with a feeling that here was an enterprise that had developed in the true American spirit.

★ ★ ★

One of the interesting pieces of equipment was a lithium atmosphere annealing furnace. Apart from its gigantic size, it was unusual in that it had a rotating base to insure uniform annealing of the tremendous wire charge in it.

★ ★ ★

The Directors of The Wire Association are deeply grateful to AS&W's officials for the many courtesies shown their guests and for their kindness in opening these

UNION WIRE DIE CORP.

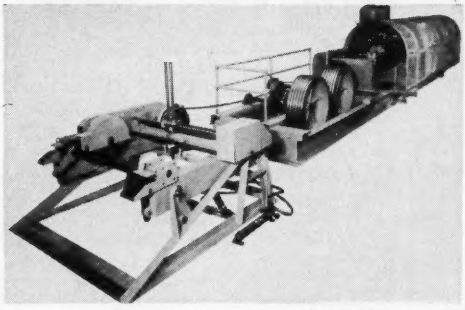
71 West 45th Street • New York 36, N. Y.

Main Plant: 375 Fairfield Ave., Stamford, Conn.

- DIAMOND DIES
- ROUND TUNGSTEN CARBIDE DIES
- SHAPE TUNGSTEN CARBIDE DIES
- HEADER DIES & MANDRELS
- CARBIDE SPECIALTIES
- DIAMOND POWDER
- UNILAP-TC DIAMOND COMPOUNDS
- INDUSTRIAL DIAMONDS
- DIAMOND RECLAMATION SERVICE
- DIE RECUTTING SERVICE
- DIE ROOM MACHINERY

• • • Serving the wire drawing industry for 35 years as the ONLY manufacturer of ALL products and services for the die room.

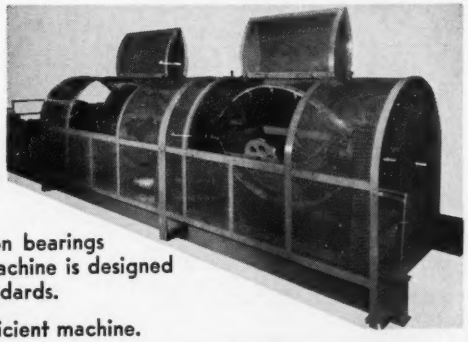
THREE-WIRE HEAVY DUTY TWISTING MACHINE



Built to handle wire from #14 to 500,000 circular mils in size on cradle reels.

Cradle reels either 30", 36" or 48" in diameter.

Rotor speeds from 800 r.p.m. to 30 r.p.m. controlled by gear box and dual drive.



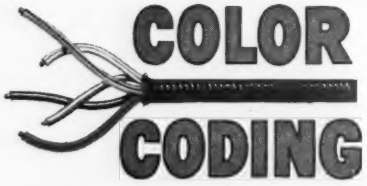
Capstans either single with fleeter sheave or double as shown with diameters of 30", 36" or 42". Rates of lay from 1½" to 36".

Welded steel frame, anti-friction bearings and multiple roll guides. The machine is designed and built to our usual high standards.

An exceedingly versatile and efficient machine.

THE EDMANDS CO., 228 ABORN STREET PROVIDENCE 3, R. I.

For permanent type



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PRINTING INKS

KEL-F Printing Inks offer the electrical industry a new permanent type medium for color coding wire and other electrical parts and equipment. Based on the uniquely stable trifluorochloroethylene polymer molecule, these inks are inherently resistant to corrosive conditions, abrasion and heat. Combining with the substrate, they form an effective bond with nylon, vinyl, KEL-F Plastic and other plastic materials. Oven or air dried after application, KEL-F Printing Inks provide dependable service in environments that render other types of inks ineffective. *Use coupon below for complete information.*

KEL-F Printing Inks are available in the following colors

BLUE	BROWN
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GREEN	WHITE
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Chemical Manufacturing Division
P. O. Box 469, Jersey City 3, N. J.
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TITLE_____
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ADDRESS_____
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fine mills for our members' inspection.

* * *

A box luncheon was provided each visitor for the return trip and all were brought back to the hotel in good season.

* * *

This trip concluded the 1955 Convention activities.

* * *

Too much cannot be said in praise of the Program Committee for the very effective and efficient manner of handling the details of the entire affair. **John A. Moritz, Jr.,** President of **Standard Industrial Compounds Company** and General Program Chairman, deserves the wholehearted congratulations of the Association's officers and members for his splendid generalship. He was assisted in his work by a group of very able and hard-working committeemen to whom the Association is also grateful. These were:

FERROUS DIVISION
Chairman
STEWART S. GRAY, Asst. Vice Pres.
Union Wire Rope Corp.
Kansas City, Mo.
Committee Members
THEODORE B. DULL, Superintendent Wire Mill
Sheffield Steel Division
Armco Steel Corp.
Kansas City, Mo.
EDMUND D. SICKELS, Editor
Wire and Wire Products
Stamford, Conn.

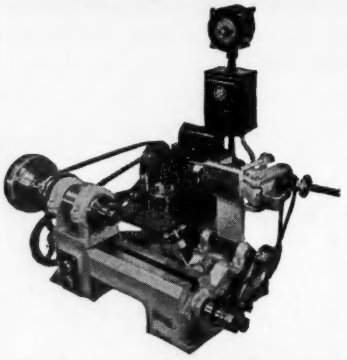
NON-FERROUS DIVISION
Chairman
BENOIT J. SIROIS, Met. Engineer
Phelps Dodge Copper Products Corp.
Elizabeth, N. J.
Committee Members
HUGO W. BISKEBORN, Dir. of Mfg.
The Ansonia Wire & Cable Co.
Ansonia, Conn.
WILLARD deCAMP CRATER, Mgr. Vinyl Sales
Naugatuck Chemical Div.
United States Rubber Co.
Naugatuck, Conn.
CHARLES M. FREDERICKSON, Asst. Plant Supt.
Kaiser Aluminum & Chemical Corp.
Newark, Ohio
ANDREW PUDLAK, Field Engineer
Copperweld Steel Corporation
Glassport, Penna.

GENERAL ACTIVITIES
Executive Secretary
RICHARD E. BROWN
The Wire Association
Stamford, Conn.

CUT Die Room COSTS 50% with the New type "M"

DYKREX
"IT CORRECTS THE DIE"

automatic Polishing Machine



Double your finished Tungsten Carbide Die production

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Save ½ labor costs—

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The new automatic polisher with the Time Switch—

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It is completely assembled—just plug it in!

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Dykrex Corporation of America
manufacturers of
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33 Bloomfield Avenue
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Teletype Service
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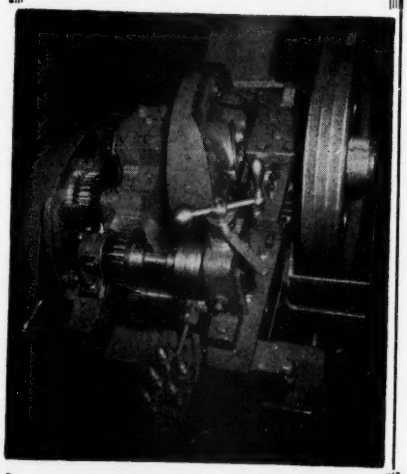
The Standard of the Wire Industry

1000 STAPLES PER MINUTE!!!

are made on the

HUMPHREY STAPLE MACHINE



Top View, showing Fly Wheel & Gears

MAKES: FENCE Staples
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Double Pointed Tacks

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Gauges 8 through 18

Efficient, Compact
Easily Adjustable

Models: Belt or Motor Drive

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Music Wire for Industrial Purposes
211 sizes Bright Polished, .0015" to .3437"
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Aluminum—Annealed—Belt Lacing—Brass, Soft and Spring—Copper, Bare and Tinned
Coppered Steel Spring—Galvanized—Tinned
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in an Envelope—Florist Wire—Spooled and Coiled, 1/4-1/2-1-5#
Wires Straightened and Cut to length—Small Gauges—Small orders our specialty
Wires and Strands for the fishermen. Trolling Wires, Copper-Monel-Stainless.
Leader Wires, "Wilstabrite" Stainless and "Silverbrite" Music.

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2514 Vestry Ave. Established in 1884 **Cleveland 13, Ohio**

WIRE POTS
SPELTER PANS
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QUALITY PRODUCTS SINCE 1895

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The Wire Association
Stamford, Conn.
Entertainment
EBER J. HUBBARD, President
Hubbard Spool Company
Garrett, Ind.

★ ★ ★

The ladies who accompanied their menfolk to the Convention were entertained on Wednesday evening at a dinner party arranged by **Mrs. Walter A. Smigel** and **Mrs. Leslie C. Whitney,** who were the hostesses for the occasion. About 60 ladies attended the dinner.

★ ★ ★

The 1955 Convention in Chicago was one of the great ones. It set a new goal of achievement for subsequent program committees to emulate. From the valuable technical sessions and the many opportunities for private conferences, the persons who were fortunate enough to be able to attend this affair were able to take back to their jobs in the mills much very worth-while information of a utilitarian nature. That is as it should be!

WEMCO MOLTEN METAL PUMP

Air Driven
for
Rapid Transfer
of
ZINC
LEAD
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THEIR ALLOYS
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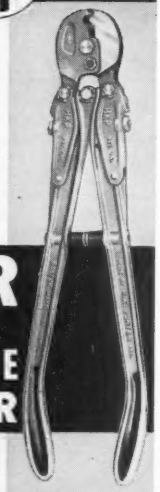
CLEAN CUTTING SHEAR ACTION

Cut coarse or fine stranded material cleanly with this Porter Notched Shear Cable Cutter. No crushing or deforming of cable. Capacity — up to ¾" cable and wire rope.



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STEEL CABLE CUTTER

— FOR CUTTING RODS Ask for —

PORTER Center-Cut CUTTERS

For general cutting of soft or medium hard rods, up to ⅝" diameter. Porter No. 4CCRE Round Edge Center Cut Cutter for cutting hard rods up to ½" diameter.

Order from your supplier or write direct to

H. K. PORTER, INC. Somerville 43, Mass.

DIAMOND POWDERS

For the finest quality, accurately graded diamond powders—specify DANFORTH.

They will cost more than "bargain basement" powders, but will finish your dies more economically.

RECLAIMING

We will take your waste and reclaim it for you, guaranteeing that it will be 99% or better pure. Also, it will be returned properly graded for further use.

Get our prices and information on our processes.

C. W. DANFORTH CO.

Established in 1912

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American Chain & Cable Adds to Michigan Factory

Plans for a $500,000 addition to its factory at Adrian, Michigan have been announced by **E. J. Williams**, vice president, operations of the **American Chain & Cable Company, Inc.** The new section will be 88 feet wide and 233 feet long and erected of brick and steel. It will add approximately 20,500 square feet of working space, making a total of about 200,000 square feet under plant control.

★ ★ ★

One of Adrian's oldest industries, the company has spent close to $2,000,000 in improvements at Adrian alone since World War II. The addition will cost in the vicinity of $210,000 and new equipment to be installed will cost an additional $253,000.

★ ★ ★

Arthur Kapnick, plant manager, said that the working force of about 900 will be increased somewhat when the new facilities are completed early in 1956. The company's Adrian division manufactures automobile emergency brake controls, aircraft controls, stainless steel aircraft terminals and other products.

To Handle Sale of Diamond Compounds

Whittaker, Clark & Daniels, Inc., 260 West Broadway, New York 13, N. Y., have announced the addition of a line of diamond powder compounds, to be offered under the trade name "Diadem."

★ ★ ★

Diadem compounds are made by incorporating scientifically, graded and shaped diamond particles in a unique formula. The diamond particles as used in the Diadem compound are all prepared from pure virgin bort. Tubes contain 5 grams of Diadem compound, each clearly marked to show the micron size.

★ ★ ★

Diadem is put up in a unique type of polyethylene container, which permits the consumer to

FOR BETTER PRODUCTION

NATIONAL OFFERS YOU THREE SERVICES

- DIAMOND POWDER RECLAMATION — Exclusive process that gives maximum recovery. Send us your old cotton, die washings, worn wheels and sludge. High salvage percentages will pay you well.
- DIAMOND POWDERS—Complete line of graded quality powders for all lapping and finishing operations on wire drawing dies. First grades only.
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TRIAL & APPROVAL GUARANTEE
SPECIFIED DIAMOND CONTENT
UNEXCELLED GRADING
SUPERIOR FORMULATION

LITERATURE ON REQUEST

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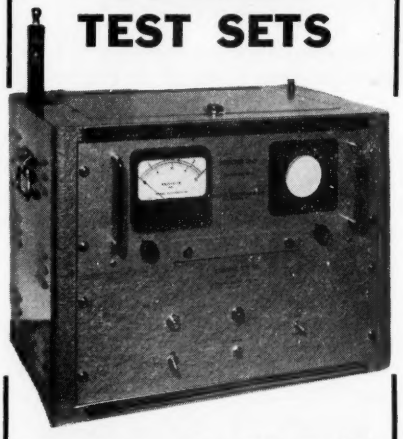
MAYWOOD, ILLINOIS

CORONA TEST SETS



Meet JAN specs, ASTM, IPCEA Standards for sample or full length cables on reels. Truly non-destructive testing. Available in all sizes from small portable unit to 50 KVA, at any desired voltage—at lowest prices.

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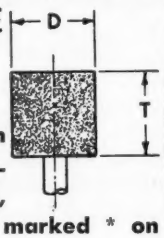
TUNGSTEN CARBIDE MATRIX

100 Grit

100 Concentration

mounted on mandrel 1½" long, ⅛" diam. Those marked * on ¼" diam. mandrel.



	D	T		
DW 144S	⅛"	¼"	Net $	10.23
DW 152S	3/16"	¼"	"	11.20
DW 160S	¼"	¼"	"	11.80
DW 163S	¼"	½"	"	15.60
DW 174S	⅜"	¼"	"	15.78
DW 176S	⅜"	½"	"	23.58
*DW 185S	½"	½"	"	34.68
*DW 194S	⅝"	½"	"	52.00
*DW 203S	¾"	½"	"	64.68
*DW 218S	1"	½"	"	110.35

INDUSTRIAL DIAMOND POWDERS, INC.

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see readily how much unused material is left. The micron size of the diamond powder is identified by a distinctive color. Seven standard micron ranges are available. These are produced in standard, light and heavy concentrations. The standard concentration is recommended unless the specialization of the use demands the other weights.

★ ★ ★

Diadem powder compounds are increasingly becoming known to many types of industrial users where a fast, efficient cutting action is desired.

★ ★ ★

This compound offers many advantages over the dry diamond powder as there is less tendency to lose the material from dusting or container contamination. Also by buying a prepared compound such as Diadem, the product is always immediately ready for use and always in the same concentration.

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The tubes are each capped with a brightly colored screw cap having the same color as the compound itself. This eliminates the chance of contamination due to exposure or resealing with the wrong cover. The tube is thrown away after use. Each tube has a long nozzle-type opening which permits access to complex applications.

New Construction Materials Featured in Latest Haveg Catalog

A new 32-page catalog, fully illustrated and describing its complete line of corrosion-resistant equipment, has just been issued by **Haveg Corporation.**

★ ★ ★

The catalog features new materials of construction and evaluates equipment molded from polyvinyl chloride, epoxy glass and polyester glass, at the same time giving data on their resistance to chemicals and heat.

★ ★ ★

Also included is information about new Haveg cements for field servicing and new Haveg

SAVE ON FREIGHT AND ASSEMBLY COSTS

ALL SIZES OF

REELS

for

WIRE ROPE

and

INSULATED WIRE AND CABLE

LIGHT WEIGHT WAREHOUSE REELS

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Let us show you HOW to SAVE on your assembly time!

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JAWS HARDENED TOOL STEEL

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SIZES

8"

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12"

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SEE YOUR LOCAL MILL SUPPLY DEALER

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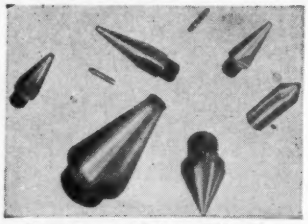
Get High EXTRUSION PRODUCTION



Some types and sizes of Nozzles.

with CARBIDE NOZZLES

(made for all makes of Extruders for electric wire)

One major Electric Wire and Cable concern has produced over 40 MILLION FEET of electric wire with our NOZZLES. It is still in perfect condition and producing daily.

They will save you money!

You, too, can enjoy these savings. Write or call

WIRE TOOL DIVISION

BRIDGEPORT JIG BORING COMPANY

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BARE ELECTRICAL TINSEL CONDUCTOR for Telephone • Razor • Hearing Aid Cords

Silver Coated Copper Wire

Round for Kel-F & Teflon Insulated Radio and Instrument Hook-up Wire and UHF Cables.

Flat for Tinsel Ribbons and Tinsel Garlands.

NEVA-TARN—Metallic Yarns—Non Tarnishing—for knitted and woven fabrics.

Novelty Yarns — All Constructions

THE MONTGOMERY COMPANY

Est. 1871

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REELS • SPOOLS

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WOOD - PLYWOOD - WOOD - METAL

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DURKEE MFG. CO., INC. PINE RIVER, MINN.

WE BUY WE SELL

We Pay Highest Prices for Used Machinery

ONE NEW HYDRAULIC HIGH SPEED INDUSTRIAL OVEN

DUAL TAKE-UP STAND, COMPLETE WITH DRIVES.

All Machines Reconditioned in Our Own Shop

WIRE & TEXTILE MACHINERY INC.

P. O. BOX 436, PAWTUCKET, R. I.

mortars for brick and tile. Rating data for Haveg exhaust fans, a description of a new method for fitting Haveg pipe on the job, and a revised chemical resistance table offer present users of Haveg molded plastic equipment a valuable supplement to their technical files.

★ ★ ★

The catalog will appear in the 1956 edition of Chemical Engineering Catalog. Individual copies, however, may be obtained by writing Haveg Corporation, 900 Greenbank Road, Wilmington 8, Del., specifying Haveg Catalog C-12.

New Cost Reduction Booklet Describes Role of Wire in Product Design

"**How** Wire Construction Reduces Costs", showing the use of wire in improved product design, is a study of 36 illustrated case histories compiled by **E. H. Titchener & Company,** design manufacturers of wire forms and welded wire assemblies.

★ ★ ★

The new 12-page booklet covers a wide application range, including motor mounts, fan guards, furniture, building specialities, and television components. Descriptions of each before-and-after picture point up specific advantages of wire construction, such as cost cuts in material, production, and tooling; reduced weight, simplified design, improved appearance, and noise and vibration reduction.

★ ★ ★

Address requests on company letterhead, with title, to E. H. Titchener & Co., 67 Clinton St., Binghamton, N. Y.

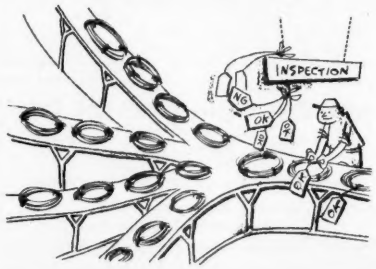
Electric Wire Concern to Move to Rhode Island

The Ansonia Wire and Cable Company, now in Ansonia, Conn., presently has a new 120,000 square feet plant under construction at Cumberland, R. I., to which it plans to remove upon the plant's completion next spring. Ansonia's new home will cost approximately $1,000,000.

What Lies Ahead

(*Continued from page* 78)

there are several machines drawing rods directly to finish size. The product of this series of machines will be put on gravity flow roller conveyors which will converge in a combined inspection, weighing, and bundling setup. In the case of rope and spring wire, physical testing facilities would be available. This sort of setup, I believe, is reasonably easy to visualize.

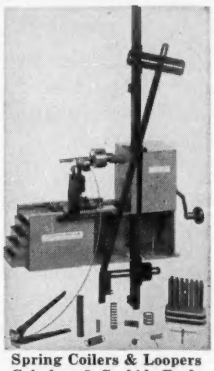


★ ★ ★

This basic concept can be applied to wire which receives one process patenting or annealing operation. It is assumed that the rods will merely be cleaned by scale breaking, and then drawn to a process size. These drawing machines will be located behind one of the modern continuous patenting or annealing, cleaning, and coating operations mentioned previously, so that their product is easily available to the swift tenders. At the opposite end of this furnace, other wire drawing machines will be placed so that when the block tenders strip the coils, they can place them immediately behind the proper machine. Then, as in the first instance, the wire is drawn to finish size, whereupon again it is put upon roller conveyors which take it to another combined inspection, testing, and bundling setup.

★ ★ ★

To create such setups from our present production facilities would require rebuilding. However, based upon my observations, the savings of manpower and elapsed time could make a sizeable dent in operating costs. This statement implies that maximum use will be made of mechanical and electrical devices to do the work now ac-



Spring Coilers & Loopers
Grinders & Carbide Tools

SPRING MACHINES

For coiling Compression, Extension and Torsion springs. Ideal for making samples and small lots up to 1000 quickly and accurately.

Available in two sizes.

For testing loads and deflections of Compression and Extension springs.

Available in four capacities: 25, 100, 200 and 300 lbs.

Write for prices and bulletins.

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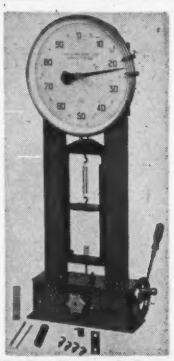
Phone BArclay 7-2552



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complished by the working man.

★ ★ ★

This conclusion is reinforced by my knowledge of the cost savings involved in some of the simpler approaches to automation. If we will only grasp this concept in its entirety, and apply it, a second industrial revolution will occur in the wire industry. Although this is optimistic thinking, automation will never completely encompass all wire production just as continuous wire drawing machines have never completely eliminated the old type bench drawing. However, for large tonnage operations, it is my answer to What Lies Ahead.

★ ★ ★

Automation is here, and here to stay. Advertisements and articles in magazines are continually impressing the point on our minds. Those whose imaginations can envision wire mills producing as nearly as possible to the slogan "untouched by human hands", and can put their thoughts into effect, will be the leaders of our wire industry in the years to come.

Outstanding Personalities of the Wire Industry

(*Continued from page* 95)

The Wire Association was organized twenty-six years ago. In 1954 he was one of the recipients of a Silver Anniversary Certificate, awarded to those who have had an unbroken membership for twenty-five years.

★ ★ ★

Not content with just being a member, he took part in many of the Association's affairs and is one of the best known and liked of the original members. His wide

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circle of acquaintances will wish him well and hope that he will have many more active and interesting years with his hobbies.

Durant Opens Branch Office For New York Area

The Durant Manufacturing Company of Milwaukee, Wis. announces the opening of its new branch office on November 1, 1955, at 271 North Avenue, New Rochelle, N. Y.

★ ★ ★

B. J. Glista, factory-trained Sales Engineer, has been appointed New

B. J. Glista

York District Office Manager for the Company's products: Productimeter Counting and Measuring Devices. Mr. Glista is a graduate engineer with ten years' sales engineering experience in the industrial and instrument counting field. He served as a naval pilot during World War II with rank of Lieutenant Commander.

★ ★ ★

This new office will render complete field service on counting and measuring requirements in metropolitan New York and northern New Jersey. The establishment of the New York branch office is in line with the Company's policy to

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General Manager Appointed By Willey's Carbide

F. H. Willey has announced the appointment of **Donald N. McPherson** as General Manager of **Willey's Carbide Tool Company,** Detroit Mich. Mr. McPherson formerly assistant secretary of the Excello Corporation joined Willey's in 1953. He will be responsible for the production and co-ordination of the expanded Tungsten Carbide Metal Manufacturing Division and the Tool Manufacturing Division.

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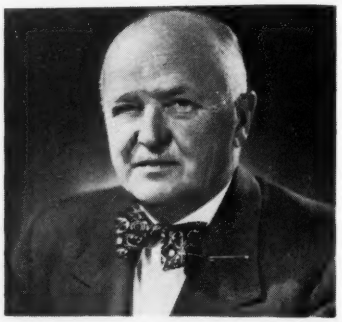
Electrical Manufacturers Elect J. W. Corey

J. W. Corey, president of **The Reliance Electric & Engineering Company,** Cleveland, Ohio, manufacturers of motors and generators, was elected president of the **National Electrical Manufacturers Association** at a recent business meeting of the NEMA board of governors. The election took place in connection with the annual meeting of the Association.

★ ★ ★

Mr. Corey, former vice president of NEMA, and a member of the board of governors since 1951, succeeds **Albert F. Metz,** chairman of the board and chief executive officer of the **Okonite Company,** Passaic, N. J.



J. W. Corey

★ ★ ★

In addition to the president, the NEMA board also elected five vice presidents and a treasurer.

Vice Presidents: **F. F. Loock,** president, **Allen Bradley Company,** Milwaukee, Wis.; **J. J. Mullen, Jr.,** president, **Moloney Electric Co.,** St. Louis, Mo.; **B. C. Neece,** president, **Landers, Frary & Clark,** New Britain, Conn.; **W. V. O'Brien,** vice president and general manager, Apparatus Sales, **General Electric Company,** New York, N. Y.; **J. L. Singleton,** vice president, Industries Group, **Allis Chalmers Manufacturing Co.,** Milwaukee, Wis.

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Reinherz Co., J., Maywood, Ill.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Union Wire Die Corporation, New York, N. Y.
United States Industrial Diamond Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Danforth, The C. W. Co., Youngstown, Ohio
Industrial Diamond Powders, Inc., Pittsburgh, Pa.
Kay & Warren Co., Brooklyn, N. Y.
Kelly Wire Die Corp., New York, N. Y.
National Research Co., St. Clair Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Union Wire Die Corporation, New York, N. Y.

DIAMOND TOOLS—
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Molina-Straus Diamond Products Co., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Michigan.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Michigan.

DIES—Cold Heading
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Union Wire Die Corporation, New York, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Michigan.

DIES—Diamond
Ajax Industrial Supplies, Inc., Ft. Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., New Brunswick, N. J.
Cochaud Wire Die Inc., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N.Y.
Union Wire Die Corporation, New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES DIAMOND—Reversible
National Wire Die Co., New York, N. Y.

DIES—Extrusion
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Michigan.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc, New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Cochaud Wire Die Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die., Inc., Fort Wayne, Ind.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y
Union Wire Die Corporation, New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Michigan.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Wire Packaging
Continental Can Company, Van Wert, Ohio

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Co., Garrett, Ind.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

DRYING EQUIPMENT
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Lubricants—Hans C. Bick, Inc., Reading, Pa.
Wire Mill—Clarence S. Arms, Worcester, Mass.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILM—Insulating
Standard Film Products Corp., Pawtucket, R. I.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Drever Company, Bethayres, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., Fairfield, Conn.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Resistance Heating, Strand
(See Annealing Machines)

FURNACES—Salt Bath
Ajax Electric Co., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

GAUGES—Wire Diameter, Continuous
Industrial Gauges Corporation, West Englewood, N. J.

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worchester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HARDSURFACING ALLOYS—
(See Alloys—Hardsurfacing)

HOOKS—Pickling & Liming
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INSULATING MATERIALS—
Celanese Corporation of America, New York, N. Y.
Chemical Products Co., E. Providence, R. I.
Electronic Rubber Co., Stamford, Conn.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Plymouth Cordage Company, Plymouth, Mass.
Standard Film Products Corp., Pawtucket, R. I.

INSULATING MATERIALS—Paper (For Electric Wire Cable)
Plymouth Cordage Company, Plymouth, Mass.

KETTLES—Galvanizing
National Annealing Box Co., Washington, Pa.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
Chemical Products Co., E. Providence, R. I.

LAGGING—Reel
North Anson Reel Co., No. Anson, Me.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Rome Soap Mfg. Co., Rome, N. Y.
Standard Industrial Compounds Co., Chicago.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.
Ironsides Co., The, Columbus, Ohio

LUBRICANTS—for Metal Cutting, etc.
Ironsides Co., The, Columbus, Ohio

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Bending Wire
Eisler Engineering Co., Newark, N. J.

MACHINERY—Bobbin Winders
Mummert-Dixon Company, Hanover, Pa.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Braiding
New England Butt Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Providence, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Haskell-Dawes Machine Co Philadelphia, Pa.
New England Butt Co., Providence, R. I.
New York Engineering Co., Yonkers, N. Y.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Machinery—Winding Wire)

MACHINERY—Centerless Grinding
Schumag Schumacher Metallwerke, Aachen, Germany.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Wells, Frank L., Co., Kenosha, Wis.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Die Making

Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Union Wire Die Corporation, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches

Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling

American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Rockwell Co., W. S., Fairfield, Conn.

MACHINERY—Extruding

Davis-Standard Sales Corp., Mystic, Conn.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence

Glader, Wm., Machine Works, Chicago, Ill.

MACHINERY—Flat Wire

Fenn Manufacturing Co., Newington, Conn.
Mettler Machine Tool, Inc., New Haven, Conn.
Rockwell, W. S., Company, Fairfield, Conn.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire

Baird Machine Co., Stratford, Conn.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Galvanizing Wire

Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders

Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding

Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire

American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lacquering Electric Wire

American Insulating Mach'y Co., Philadelphia.
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.

MACHINERY—Lock Washer

Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving

Mummert-Dixon Co., Hanover, Pa.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Material Handling

(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable

Davis Electric Company, Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack

Baird Machine Co., The Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Packaging Wire

Coulter & McKenzie Machine Co., Bridgeport, Conn.

MACHINERY—Pickling

Youngstown Welding & Eng'g Co., Youngstown, Ohio.

MACHINERY—Pin Making

Baird Machine Co., The, Stratford, Conn.

MACHINERY—Pointing

Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used). New York.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury Conn.

MACHINERY—Pumps for Molten Metal

Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Re-Spooling

Davis Electric Company, Wallingford, Conn.
Emory, Robert J., Co., Newark, N. J.
Mummert-Dixon Co., Hanover, Pa.
National Mach'y Exch. (Used), New York.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Rod Mill

Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Schumag Schumacher Metallwerke, Aachen, Germany

MACHINERY—Rolling Mill

Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating

Davis-Standard Sales Corp., Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving

Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing

Davis Electric Company, Wallingford, Conn.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making

National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple

Nilson, A. H. Machine Co., Bridgeport, Conn.
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Straightening & Cutting

Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding

Haskell-Dawes Machine Co., Philadelphia, Pa.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging

Fenn Manufacturing Co., Newington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out

American Insulating Mach'y Co., Phila., Pa.
Davis Electric Company, Wallingford, Conn.
Davis-Standard Sales Corp., Mystic, Conn.
Fenn Manufacturing Co., Newington, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio.
New York Engineering Co., Yonkers, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Taping

American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes

Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical

Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire

American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills

American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire

Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing

Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Turks Head

Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Twinning

(See Mach.—Bunching)

MACHINERY—Twisters, Wire

Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Company, Wallingford, Conn.
Edmands Company, The, Providence, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used

National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding

(See WELDERS—Butt and Spot)

MACHINERY—Winding Wire

Emory, Robert J., Newark, N. J.
Fenn Manufacturing Co., Newington, Conn.
Mummert-Dixon Co., Hanover, Pa.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Wire Drawing

Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fenn Manufacturing Co., Newington, Conn.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Herborn, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
Morgardshammers Mek Verstads AB, Morgardshammer, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Schumag Schumacher Metallwerke, Aachen, Germany
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Larmuth (1947) Ltd., Swinton, England
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Rockwell Co., W. S., Fairfield, Conn.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio.

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Spelter, Galvanizing, Lead
National Annealing Box Co., Washington, Pa.

PAPER—Creped Wrapping
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—Insulating
Plymouth Cordage Company, Plymouth, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Youngstown Welding & Eng'g Co., Youngstown, Ohio

PICKLING TANK LININGS—
Chemsteel Construction Co., Inc., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTICIZERS—
Celanese Corporation of America, New York, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.

PLASTICS—for Wire Insulation
Celanese Corporation of America, New York, N. Y.
Electronic Rubber Co., Stamford, Conn.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Wire Tinning
National Annealing Box Co., Washington, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

PUMPS—Molten Metal
Fisher Associates, New York, N. Y.

REEL AND TENSION STANDS—
Davis Electric Company, Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio.
New York Engineering Co., Yonkers, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Muncy Valley Industries, Inc., Muncy Valley, Pa.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Muncy Valley Industries, Inc., Muncy Valley, Pa.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
North Anson Reel Co., No. Anson, Me.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Co., Garrett, Ind.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
American Pulley Co., Philadelphia, Pa.
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
North Anson Reel Co., No. Anson, Me.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Muncy Valley Industries, Inc., Muncy Valley, Pa.
Nelson Company, The, Baltimore, Md.
North Anson Reel Co., No. Anson, Me.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RETORTS—Annealing
National Annealing Box Co., Washington, Pa.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Titan Metal Manufacturing Co., Bellefonte, Pa.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Steel Corp., Kansas City, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

TANKS—Compound
National Annealing Box Co., Washington, Pa.
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
Chemsteel Construction Co., Inc., Pittsburgh, Pa.
National Annealing Box Co., Washington, Pa.

TESTERS — INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.
Wire Equipment Mfg. Co., Trenton, N. J.

TOOLS—Wire Cutting
Porter, H. K. Inc., Somerville, Mass.

TOOLS—Spring Forming, Carbide
Crafts, Arthur A., Company, Inc., Boston, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES & LACQUERS—for Electric Wire
Chemical Products Co., E. Providence, R. I.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIRE—Aluminum
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Scovill Mfg. Co., Waterbury, Conn.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass and Bronze
Chase Brass & Copper Co., Waterbury, Conn.
Jury's Wire Products, Inc., Bloomfield, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Bunched & Stranded, Copper
Camden Wire Co., Camden, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Camden Wire Co., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Titan Metal Manufacturing Co., Bellefonte, Pa.
Wickwire Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Camden Wire Co., Inc., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Jury's Wire Products, Inc., Bloomfield, N. J.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.

WIRE—Flat, Fine
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
National Standard Company, Niles, Mich.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Manufacturers
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Titan Metal Manufacturing Co., Bellefonte, Pa.
U. S. Steel Corp., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio

WIRE—Nickel Silver and Phosphor Bronze
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Oil Tempered
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Silver Plated Copper
Camden Wire Co., Camden, N. Y.

WIRE—Special Shapes
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Spring
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N J
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jury's Wire Products, Inc., Bloomfield, N. J.
Keystone Steel & Wire Co., Peoria, Ill
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N J.
Sheffield Steel Corp., Kansas City, Mo.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tinned Copper
Camden Wire Co., Camden, N. Y.
Jury's Wire Products, Inc., Bloomfield, N. J.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARNS & TAPES—Insulating
Celanese Corporation of America, New York, N. Y.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Standard Film Products Corp., Pawtucket, R. I.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE
AND MASTICATING MACHINERY MANUFACTURERS

WATSON

HIGH SPEED STRANDERS and CLOSERS "HH"

THESE UNITS, WHICH ARE UNQUESTIONABLY THE MOST ADVANCED, LARGE HIGH-SPEED MACHINE DESIGN OF RECENT YEARS, ARE NOW IN OPERATION IN MANY PROGRESSIVE AND PROMINENT PLANTS, AND HAVE PROVED TO BE THE OUTSTANDING HIGH-SPEED PRODUCER OF WIRE ROPE.

CONSTRUCTION SHOULD NOT BE CONFUSED WITH THE OLD BAR OR SNAKE DESIGNS, AS EACH SPOOL SECTION IS BUILT-UP WITHOUT THRU-RODS OR TUBES.

AVAILABLE FOR 24", 30", AND 40" DIAMETER SPOOLS.

PATENTED "SHAFTLESS" NO-LOOSE-PART BOAT CRADLES WITH INTEGRAL FRICTIONS ARE AVAILABLE. CONVENTIONAL SHAFT-TYPE CRADLES FURNISHED IF A VARIETY OF SPOOL SIZES IS TO BE LOADED.

OPEN CONSTRUCTION FACILITATES ADJUSTMENTS AND ALLOWS UTMOST FREEDOM AND RAPIDITY IN LOADING AND THREADING, THEREBY REDUCING MACHINE DOWN-TIME.

ROTOR IS ALL-STEEL, CHROME-MOLYBDENUM AND BALL-BEARING. TWO-SPEED, CONSTANT HORSE-POWER VEE-BELT DRIVE DIRECT TO ROTOR.

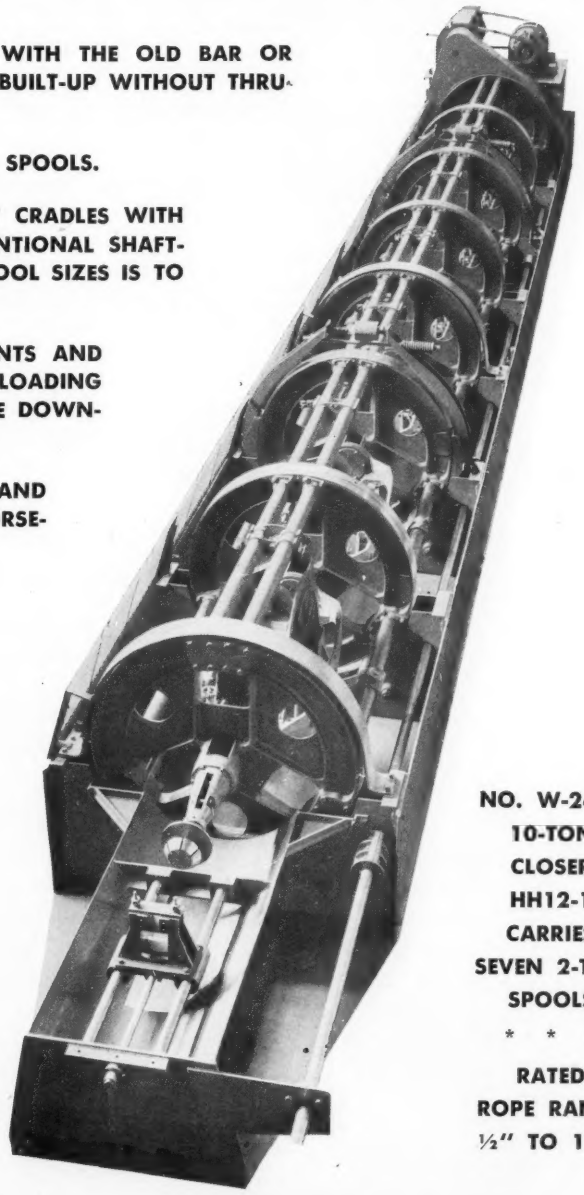
QUIET, NON-METALLIC SUPPORT ROLLERS ON ADJUSTABLE ECCENTRIC MOUNTS.

SPRING-SET, AIR-RELEASED BRAKES PROVIDE RAPID STOPS.

RIGID, ALL-STEEL-BOX FRAME FACILITATES IN-STALLATION AND INSURES PERMANENT ALIGNMENT.

CAPSTANS AND TAKEUPS TO COMPLETE MACHINES ARE AVAILABLE IN MANY TYPES AND SIZES.

NOTE: WE HAVE AND CAN STILL FURNISH LARGE TUBULAR MACHINES: HOWEVER, IN THE SIZES SHOWN THERE IS NO COST ADVANTAGE, AND THE OBVIOUS FEATURES OF THE "HH" DESIGN PREVENT OUR RECOMMENDING LARGE TUBULAR ROTORS FOR GENERAL PURPOSE REQUIREMENTS.

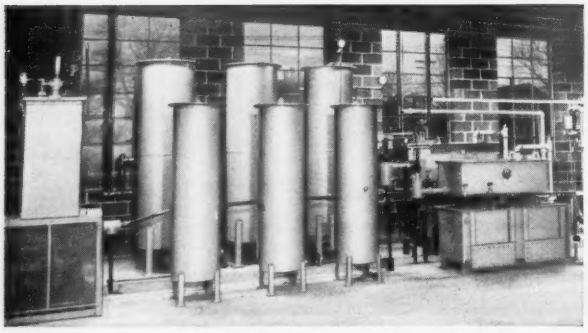


NO. W-2477
10-TON
CLOSER
HH12-1
CARRIES
SEVEN 2-TON
SPOOLS

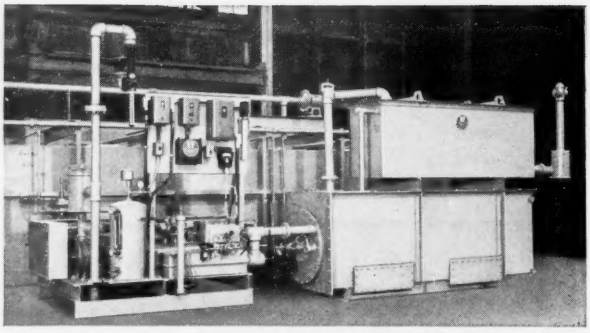
* * *

RATED
ROPE RANGE
½" TO 1½"

1-56



An EF installation consisting of a 1500 and a 3000 cfh exothermic horizontal water cooled type special atmosphere unit, each with desulphurizing towers and refrigerators for bright annealing steel and copper, and clean annealing brass.



An EF kerosene exothermic gas generator. These are also built in several sizes and types for producing special atmospheres for use in bright annealing copper and steel products in areas where fuel gases are not available.

SPECIAL ATMOSPHERE EQUIPMENT

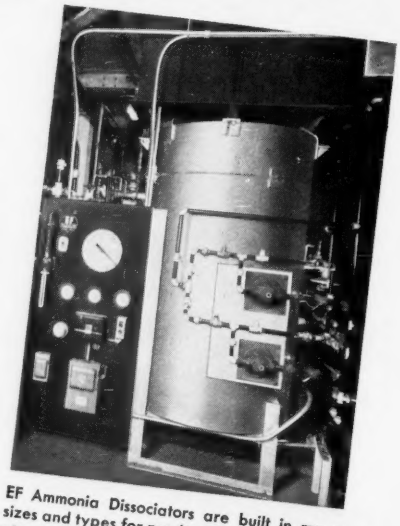
For any Heat Treating Process . . . any Capacity

Long Experience = High Efficiency + Low Maintenance

Gas scrubbing units are available in several sizes and types for use with EF special atmosphere generating equipment where it may be necessary to remove CO_2 or H_2S.

• As pioneers in the development and use of equipment for producing low cost special atmospheres, we are in position to furnish a wide range of reliable, thoroughly tested special atmosphere units, including endothermic and exothermic gas generators, ammonia dissociators, refrigerators, dryers, desulphurizers, gas scrubbing units and other special atmosphere equipment — equipment with a reputation for high efficiency,— and low maintenance and operating costs.

Submit your furnace or special atmosphere problems to experienced engineers — *IT PAYS*

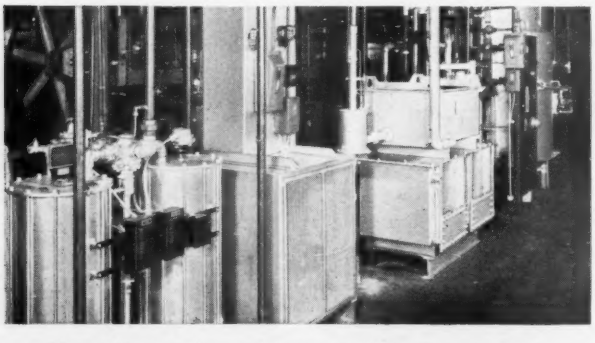


EF Ammonia Dissociators are built in many sizes and types for producing highly reducing atmospheres as required for bright annealing stainless; and other annealing and normalizing processes and preventing decarburization.

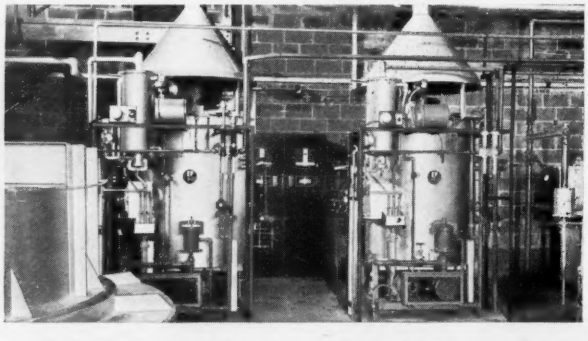
THE ELECTRIC FURNACE CO.

WILSON ST. at PENNA. R.R. *Salem - Ohio*

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION



EF special atmosphere installation consisting of an exothermic generator, refrigerator and dryer as used with EF furnaces for bright and clean annealing ferrous and non-ferrous products.



An installation consisting of two small EF oil fired endothermic generators producing special atmospheres from propane for carburizing and other processes.